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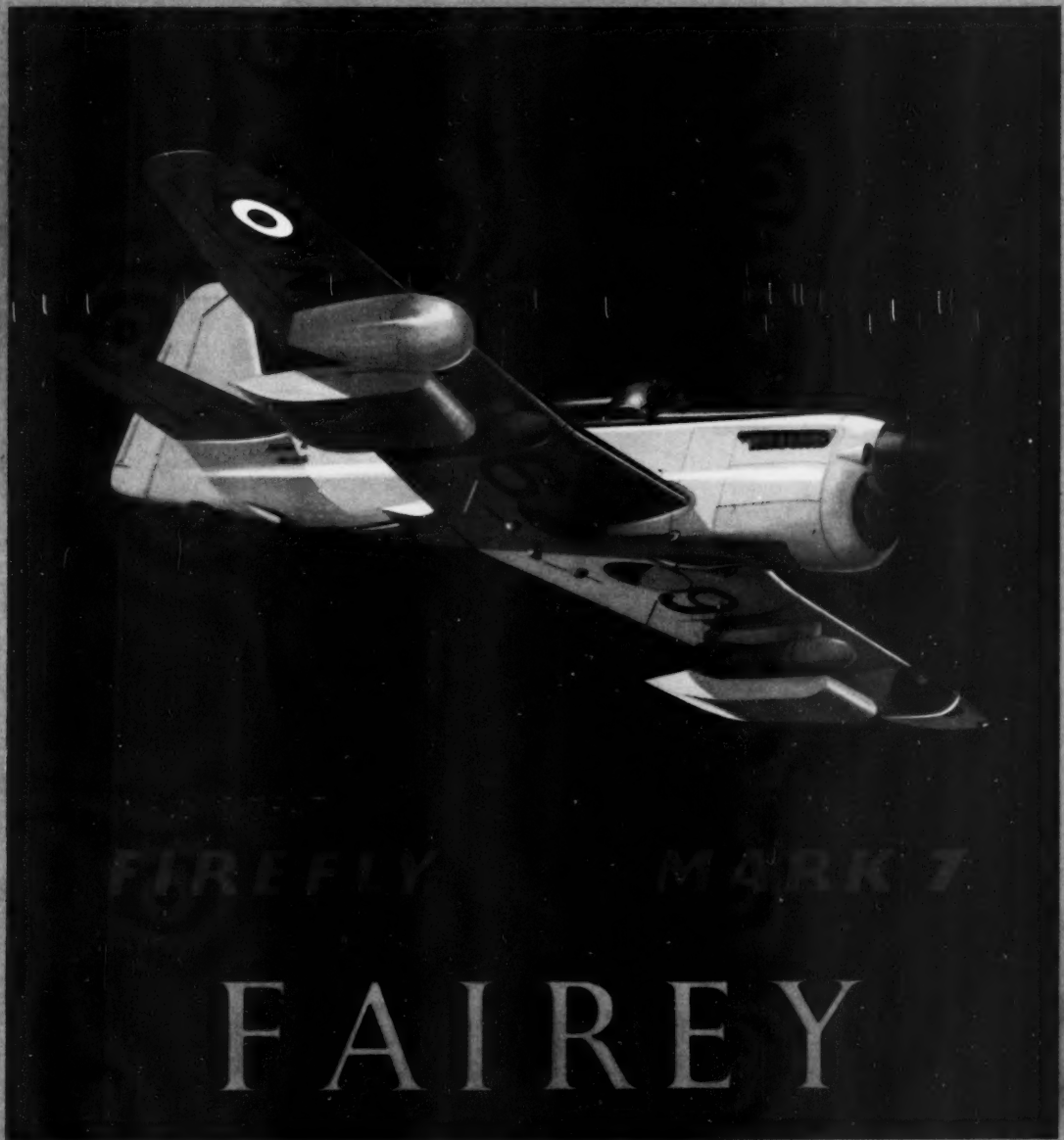

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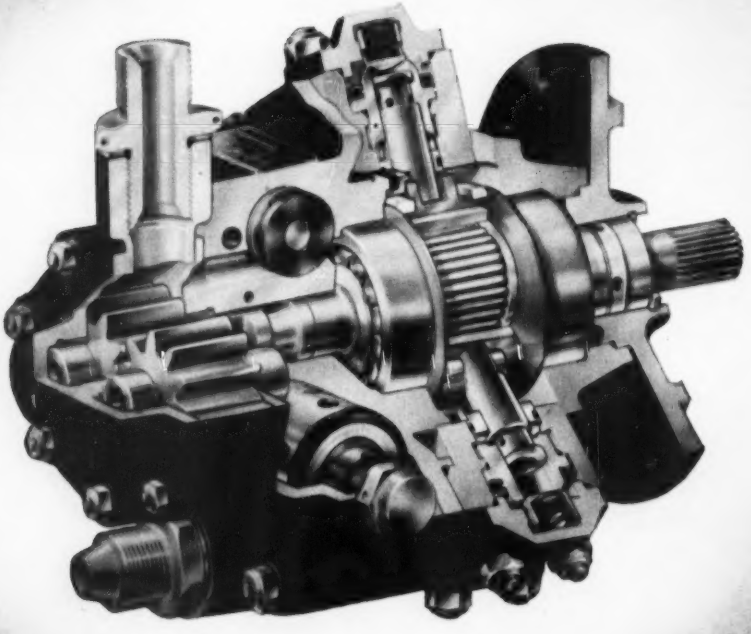

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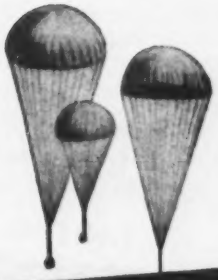

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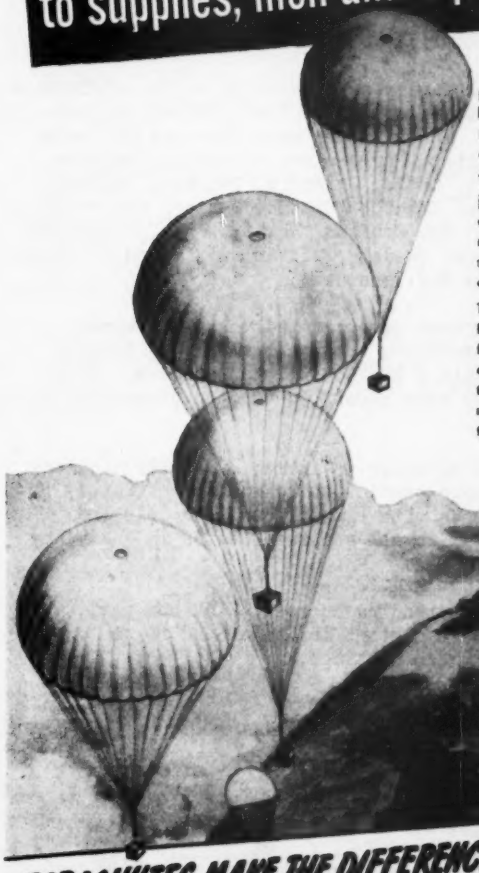

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UNITED AIRGRAM

UNITED AIRCRAFT EXPORT CORPORATION

FOREIGN AIRLINE REPRESENTATIVES MEET FOR TECHNICAL CONFERENCE ----- Recently, 49 representatives of 24 foreign airlines attended an international conference on aircraft maintenance and airline operations sponsored by United Aircraft Export Corporation. The meetings, which covered a three-day period, were held at the East Hartford plants of the Pratt & Whitney and Hamilton Standard Divisions.

All airlines represented at the conference use one or more of United Aircraft's products. The visitors were from the following countries: Argentina, Australia, Belgium, Brazil, Chile, Colombia, Denmark, England, France, Greece, Lebanon, Mexico, the Netherlands, New Zealand, Norway, Peru, Philippine Islands, Sweden, Switzerland, Union of South Africa and Venezuela.

Airline representatives attending the conference were invited to submit their questions in advance of the meetings, thus enabling the Pratt & Whitney Service Department to review each question and compile a list of written answers. Both questions and answers were on the agenda and were submitted to open discussion by those in attendance.

Debate and free exchange were encouraged in order to thrash out fully the many topics considered. While all of the operators participating are not currently operating the same type of equipment, experience with similar engine models and knowledge of repair procedures was beneficial to all representatives in analyzing their individual problems.

The conference was considered to be an outstanding success. For our part, we took it as a great compliment that airlines in distant lands decided to go to the effort of sending their representatives to these meetings.

HIGH SPEED PUMP ANNOUNCED BY HAMILTON STANDARD -- A new type of high speed pump for airplane hydraulic systems was announced recently by the Hamilton Standard Division. The pump is one of the smallest, lightest, and most powerful ever developed for the purpose. Already in limited production, it has been selected for one of the Navy's newest fighters, the Chance Vought F7U-3 Cutlass. Hamilton Standard's pump, the fourth new item of aviation equipment to be announced by this division in two years, marks a major advance in the constant effort to decrease aircraft weight. Because of its unusual operating characteristics, the new pump is smaller and lighter than standard types. Installation of a group of these pumps in one airplane has saved at least 40 pounds of weight.

In operation, the pump is driven by the aircraft engine, from which it utilizes 36 horsepower. The pump transfers this power to the aircraft's hydraulic system by circulating oil at rates up to 25 gallons a minute and pressures of 3,000 pounds per square inch. The oil thus driven exerts a force on the mechanisms required to operate such components as landing gear, flaps, brakes and control surfaces. The pump operates at speeds up to 8,250 revolutions per minute, one of the highest ever achieved in the field. It also circulates three times the amount of oil handled by slower-running units. Unusual construction of the pump permits instantaneous variation of the amount of oil being circulated to conform to the airplane's operating requirements.

SIKORSKY HO5S-1 HELICOPTER PRODUCTION FOR MARINES IS INCREASED — Production of the HO5S-1 helicopter is now in full swing alongside Sikorsky Aircraft's more extensive line of the larger S-55 types and already a steady flow of the smaller liaison HO5-S-7 craft is going to Marine Corps units.

These three-to-four-place helicopters will probably be used by the Marines on the Korean fronts. Their uses will include liaison, observation, and evacuation of the wounded. The U.S.Coast Guard, through the Navy, has also ordered an undisclosed number of these new Sikorsky HO5S-1 models.

The Sikorsky HO5-1 is the military counterpart of the S-52-2 which recently won CAA approval. The original version of this copter was the Sikorsky S-52 which set an official world's altitude record of 21,220 feet for helicopters, and a world speed record of 129.6 miles per hour.

Power plant for the HO5S is a Franklin air-cooled engine of 245 horsepower. The copter weighs 2,700 pounds, and has a quadricycle landing gear. When used as an air ambulance it carries two litter patients inside the cabin.

HAMILTON STANDARD OCCUPIES BIG NEW PLANT — The Hamilton Standard Division has virtually completed moving its entire operation to a new, modern plant of nearly 900,000 square feet, located at Bradley field, Windsor Locks, Connecticut. Plant and office facilities in East Hartford, formerly occupied by Hamilton, are being taken over by Pratt & Whitney Aircraft to meet the greatly increased demands for its turbine and piston engines. United Aircraft Export Corp. will also make its headquarters there.

The new plant, built at a cost of approximately $10,000,000, was privately financed by United Aircraft. It will permit Hamilton Standard to increase its propeller production and at the same time expand to handle increased manufacturing and engineering operations for its new line of other aviation equipment.

Hamilton Standard's new home was built in accordance with the latest ideas on industrial plant design. It will enable the division to raise production efficiency. Although moving machinery and equipment to the new plant was an immense task, production has been continued with virtually no interruptions.

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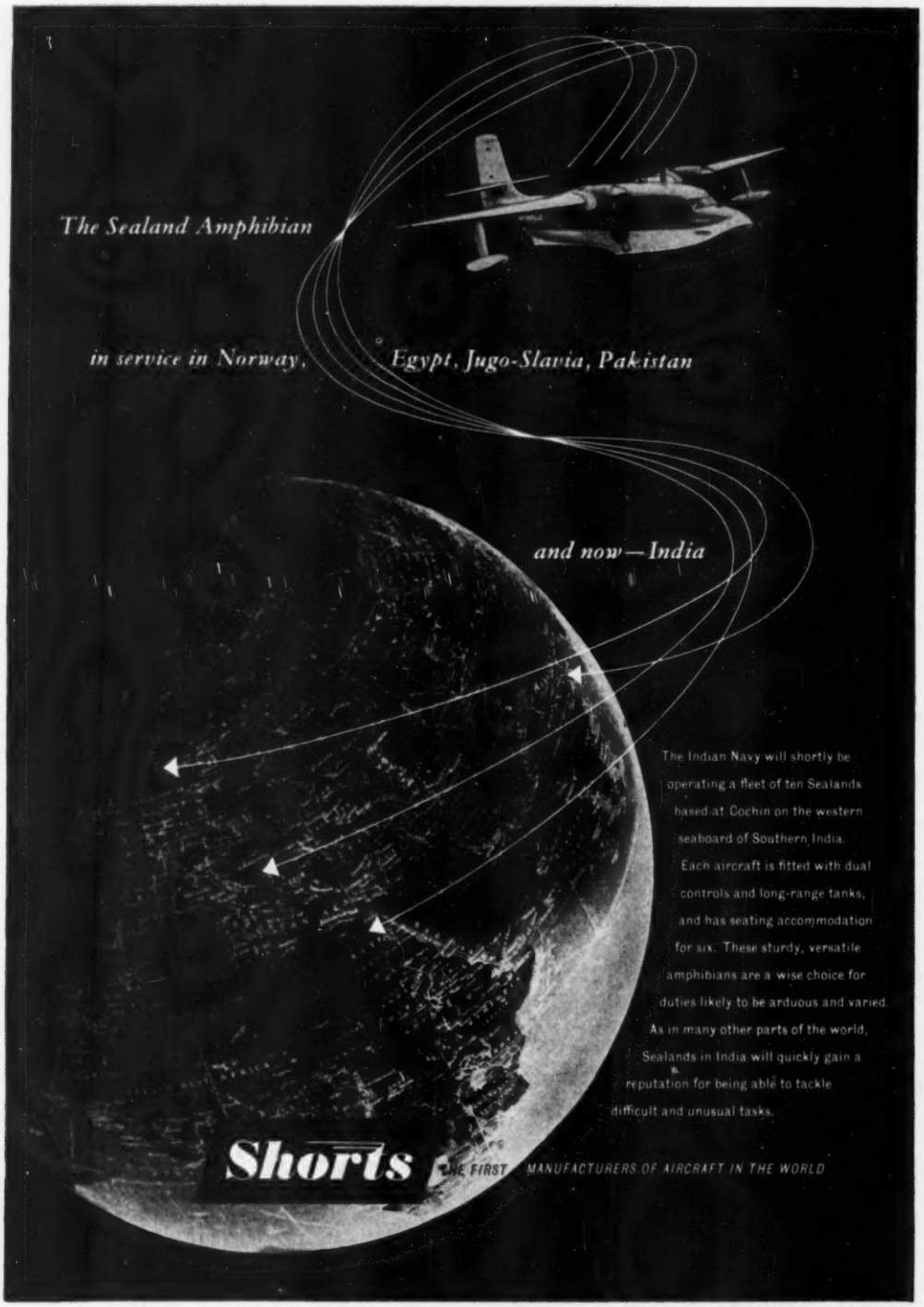
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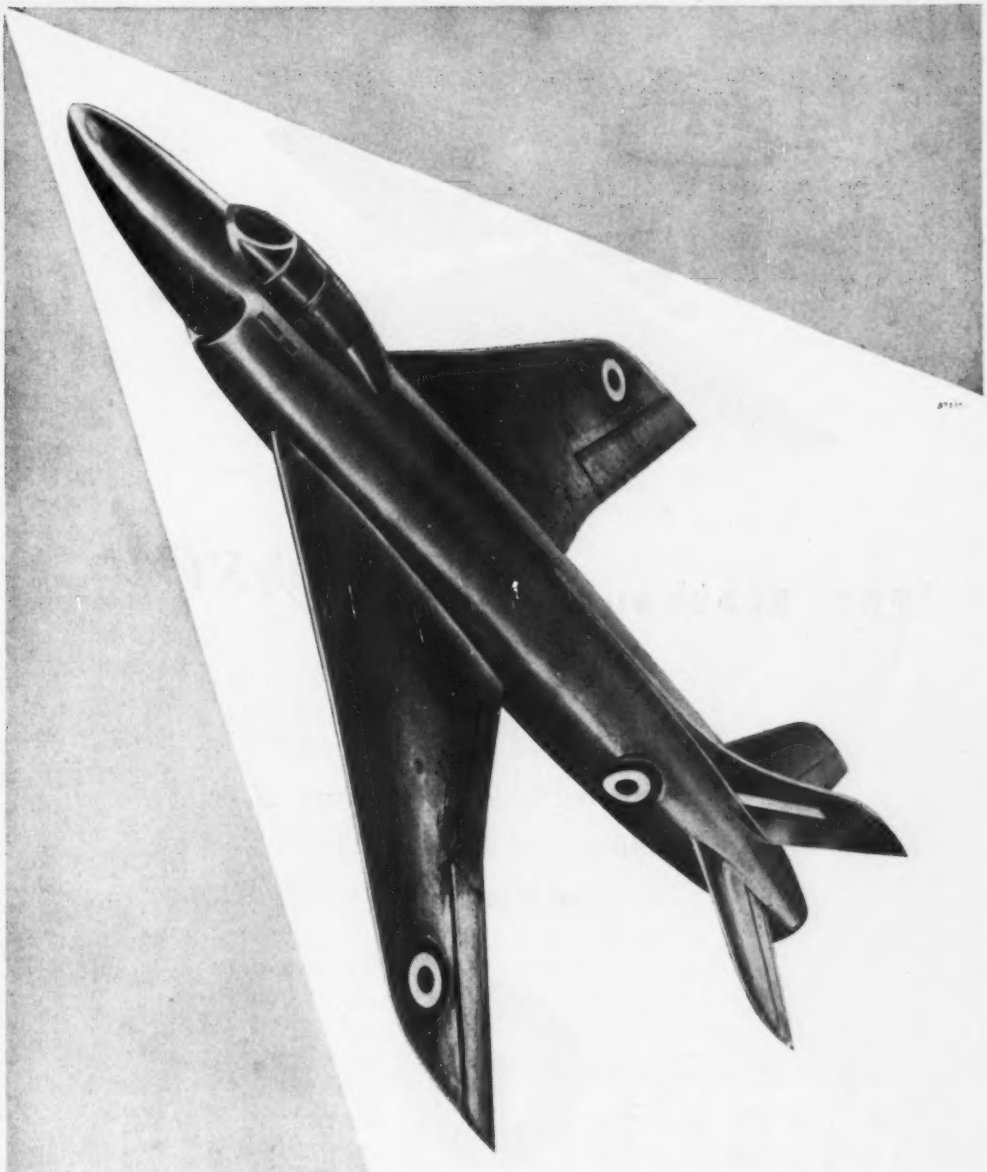

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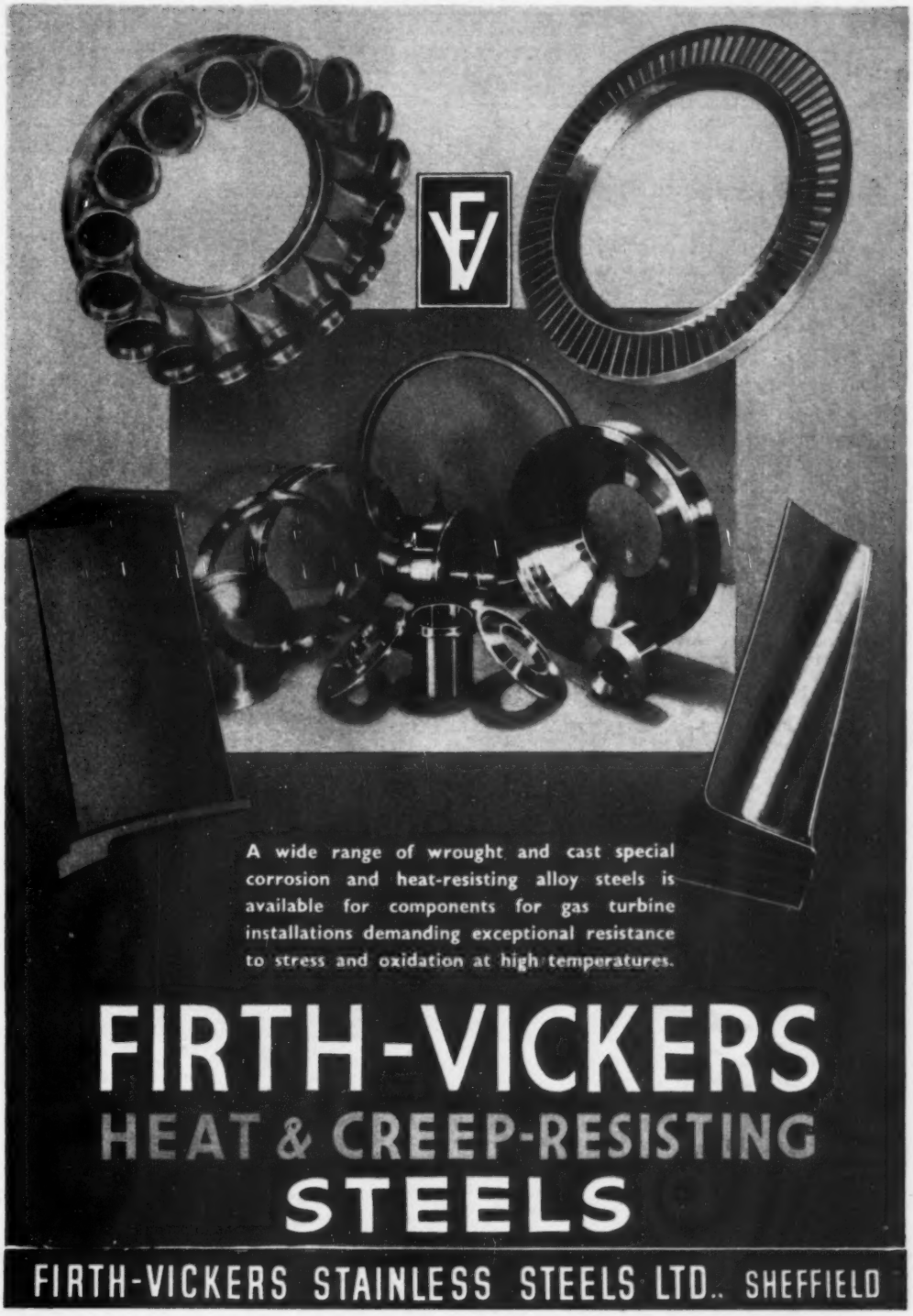
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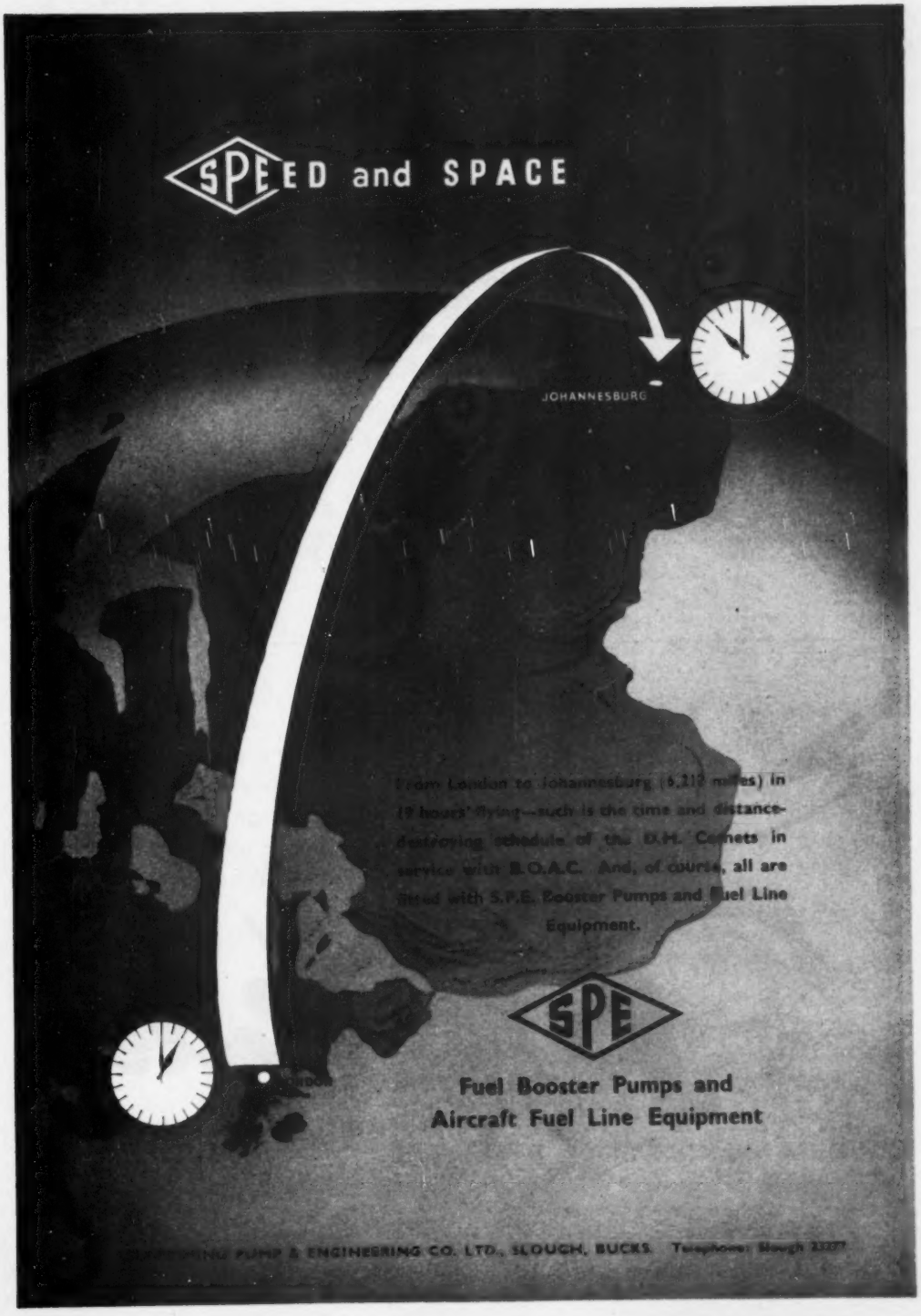
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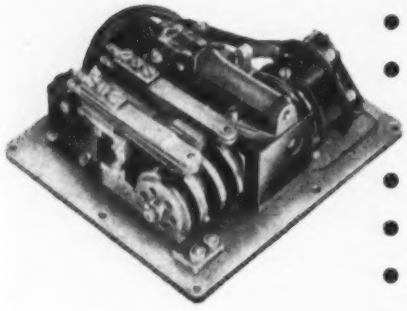

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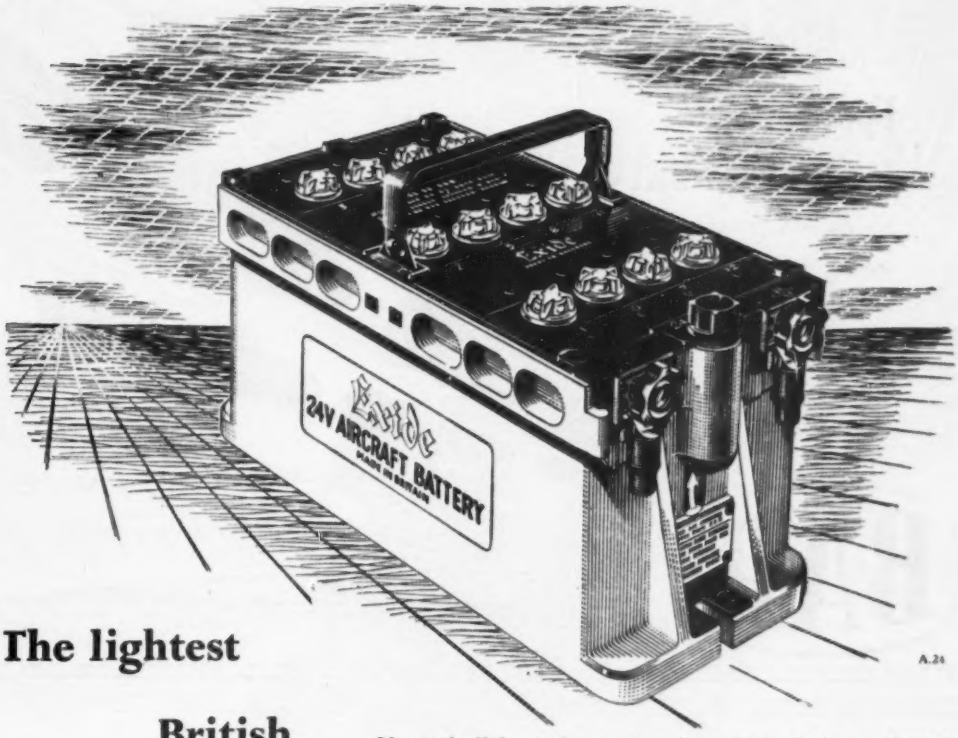

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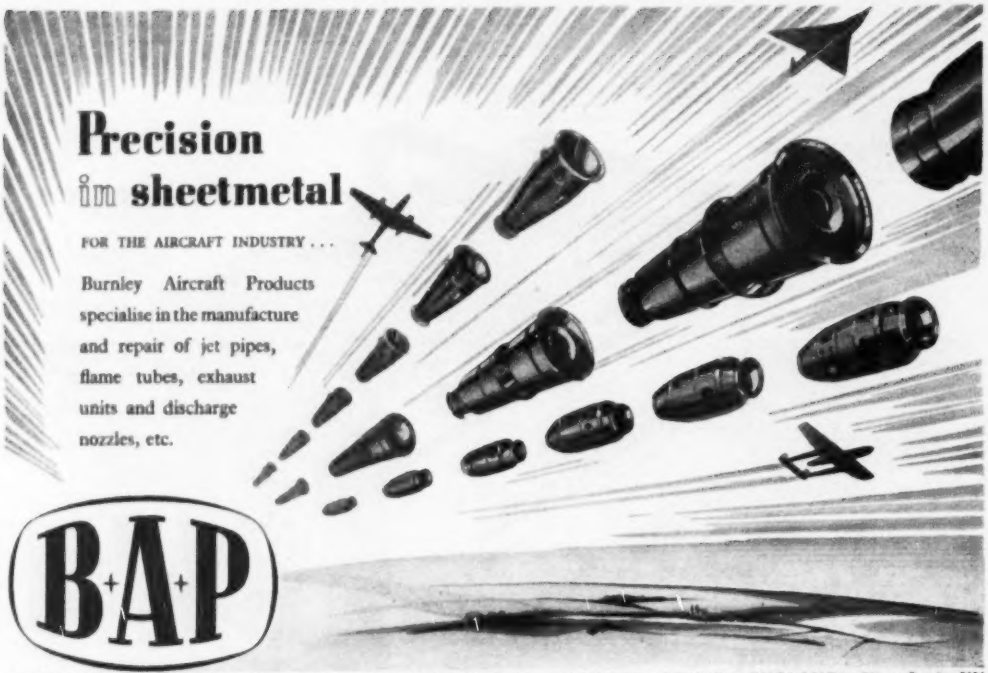
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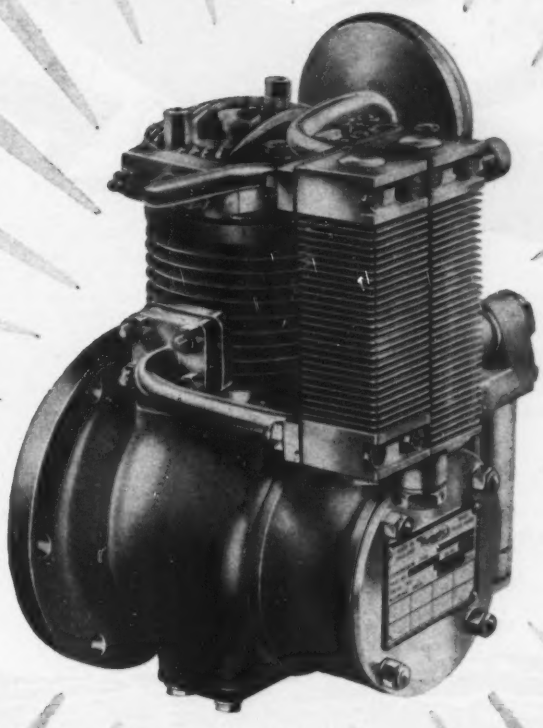

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Founded 1909

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Aspects of Ardent

"FIGHTER COMMAND have very good grounds for being soberly confident that their work is now showing real dividends . . . Bomber Command have for the first time had a chance to try out varied tactics, and the experience of 'Ardent' will prove most useful to them. . . . The ground-control radar and reporting systems have shown a very steady and progressive improvement . . ." Thus Air Chief Marshal Sir Ralph Cochrane, Vice-Chief of the Air Staff, in his summing-up of "Ardent," which three-phase air-defence exercise concluded last Sunday and is reviewed in this issue.

Perhaps the most significant aspect of Ardent was the success of the Canberras. It was already known that, when operating in their normal height band of 35,000-50,000ft, these twin-jet bombers could usually defy the best efforts of the opposing fighters, and in this knowledge the directors generally prescribed for them a maximum operating level of 35,000ft. But, they still managed to lead would-be intercepters a pretty dance.

While Fighter Command may derive some consolation from the knowledge that in performance the Canberra is probably somewhat superior to its Russian counterparts (the defensive armament of the Russian machines could offset this superiority only in a small degree), Bomber Command will recognize that, notwithstanding its triumphs, even in face of Venoms and Sabres, it might fare less successfully when up against Mig-15s.

It is true, of course, that against conventional piston-engined bombers (Lincolns, B-29s and B-50s) the Meteors and Vampires, which formed the bulk of the fighter defences, achieved marked success, both by day and by night; and this is especially gratifying because B-29s still preponderate in the potential long-range bomber threat against this country. But it is well to remember that bombers of this same type have been shot down with disconcerting consistency in Korea.

These are among the more sombre considerations of Ardent. On the other hand, there was much to applaud—not least the excellent safety record. Of about 6,000 sorties flown, almost every one involved some relatively hazardous procedure, such as low attacking, violent manœuvring, or formation landing; yet no one was hurt.

Something Old, Something New

IN this issue we print the first of a series of critical studies of historic military aircraft which, if we are not greatly mistaken, will win for themselves the same staunch readership as have our squadron histories. For, while we recognize that not everybody can afford the leisure to divert and edify himself with things past, we are aware of the growing body of amateurs (the word is applied in its true sense) who delight in rooting up delectable truffles from neglected fields of history.

The surprising truth is that many facts, the historical value of which must increase with the years, have never gone on public record; and this aspect of such reviews, apart from their intrinsic interest, unquestionably places them beyond any criticism on the score of their being "re-hashes." It is fitting, then, that stray facts should be gathered in before they are dispersed or distorted by the veering winds of time.

Only thirty-six years have elapsed since the D.H.4—the subject of our first study—took the air. Yet, notwithstanding its magnificent success and the vast scale of its production, it is now little more than a name to thousands of young men in the Services, who are quite convinced that the Mosquito was the first bomber which really gave opposing fighters a run for their money. And even by the "experts" this honour is usually accorded the Fairey Fox of 1925. Yet we find the Eagle-engined D.H.4 of 1917, with its speed of 143 m.p.h. at sea level (only 10-15 m.p.h. less than the Fox's) showing a clean pair of heels to most, if not all, the fighters of its day. Again, most people will assure one that the Canberra is the first British bomber to have been built under licence in America. They will find a big surprise on page 510.

Truly, as Swinburne had it, the past acclaims our future, for, in the very issue in which we honour the D.H.4, we give the first particulars of D.H.106 Comet derivatives, towards which the envious gaze of the world is now turned.

MORE ABOUT SUPERSONIC BANGS

A Third, and the Probable, Explanation Examined—

By C. H. E. WARREN

TWO possible explanations of what are termed "supersonic bangs" are put forward by A. H. Yates, in *Flight* for October 3rd, 1952. His first explanation was that the bangs are acoustic effects, in that they are due to an accumulation of the noise emitted by the aircraft. His second explanation was that the bangs are due to the shock waves that are formed when an aircraft flies at supersonic speeds. In fact, neither explanation can be the true one, although many of the deductions that he made are correct. It can be shown that the acoustic explanation must be rejected because it could not possibly produce bangs of the intensity of those heard at Farnborough. The shock-wave explanation must be rejected because the bangs are generated in spite of them and not because of them, as will be explained below.

Mr. Yates shows clearly the manner in which the noise due to the aircraft is propagated to the observer on the ground. He overlooks, however, the fact that the aerodynamic disturbances due to the aircraft as it flies through the air are propagated in exactly the same manner as the noise. In other words, the aerodynamic disturbances due to the aircraft, as well as its noise, are propagated in all directions with the speed of sound. It is the aerodynamic disturbances, however, that lead to the bangs. To illustrate this we must develop a little further the ideas that Yates put forward in his acoustic examination. Their application to the problem of the aerodynamic disturbances due to the aircraft will be understood more readily if we first consider an analogy.

There are two ways in which the visual sensation of a moving object can be conveyed to a theatre audience. On the stage one merely moves the object across the stage. On the screen, however, the technique is different. One shows the audience a still picture of the object in a certain position. Then, after about a twentieth of a second, one cuts off this picture and shows a picture of the object in a position slightly farther on, and so on. We are all familiar with the fact that this produces to the audience the visual sensation of a moving picture.

Likewise there are two ways in which the aerodynamic sensation of a moving aircraft can be conveyed to an observer. There is the straightforward way in which an aircraft itself is made to move in the required manner. But there is an alternative way, as follows.* One distributes along the flight path of the aircraft a long row of balloons, which in their normal (deflated) state can be assumed to occupy no space at all. The balloons, however, are capable of being inflated to a size roughly equal to that of the aircraft. By inflating one balloon and then deflating it, and then inflating the next balloon and deflating it, and so on, the aerodynamic sensation to a distant observer of an aircraft in flight can be simulated, in just the same way that the "movie" simulates the visual sensation of movement.

THIS examination of the formation and characteristics of supersonic bangs is the first published account based on actual experiments in this country. The author is a principal scientific officer of the Ministry of Supply, working at the Royal Aircraft Establishment, Farnborough. In his opening paragraph Mr. Warren refers to an article by a senior lecturer at the College of Aeronautics, Cranfield, entitled "Those Supersonic Bangs," which was published in our issue of October 3rd.

It is suggested that the build-up of the pressure field can be visualized more easily in terms of the disturbances due to these stationary balloons than in terms of those due to a moving aircraft. Indeed, in the mathematical treatment the inflation and deflation of such balloons can be represented by transient source-sink pulses distributed along the flight path. Of course, in the mathematical treatment the discontinuous row of discrete balloons can be replaced by a continuous row of infinitesimal disk-like balloons, the summation of the disturbances due to the row of discrete balloons being replaced by the integration of the disturbances due to the disk-like balloons. It is probably easier, however, to see the principles involved if one deals with the discontinuous row of discrete balloons.

We have, therefore, reduced the problem of determining the pressure field due to an aircraft moving in an arbitrary manner to that of summing the simple pressure disturbances due to a row of stationary balloons. For most of the time these balloons will be deflated, but at the instant that the aircraft would have passed each point on the flight path the local balloon will be inflated to roughly the volume of the aircraft, and then deflated again, all in the time that it would take the aircraft to fly past.

To an observer distant r from the location of a balloon, the pressure disturbance created by this balloon at time t' will be experienced over a time interval equal to the time that the balloon is inflated, but at a time t, later than the inflation of the balloon by $\frac{r}{a}$, so that $t = t' + \frac{r}{a}$, where a is the speed of sound. Now normally the pressure disturbances from only a handful of balloons will be experienced by an observer at a given time, and they, in general, will tend to cancel one another. But under certain conditions the disturbances from

* *The ideas developed here are based on some suggestions by Mr. K. V. Diprose.*

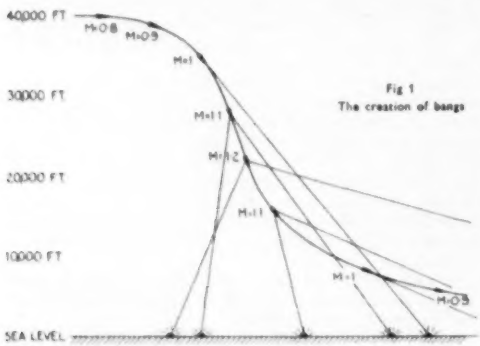

Fig 1
The creation of bangs

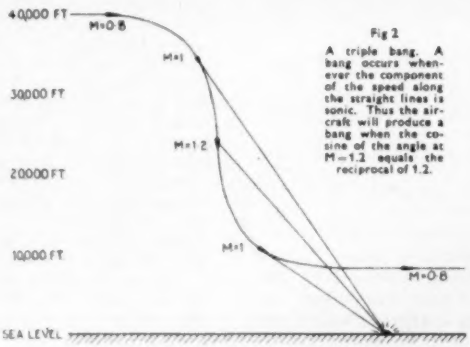

Fig 2
A triple bang. A bang occurs whenever the component of the speed along the straight lines is sonic. Thus the aircraft will produce a bang when the cosine of the angle at M=1.2 equals the reciprocal of 1.2.

a very large number of balloons can arrive at the observer simultaneously, and moreover, they will usually tend to enhance rather than to cancel one another. Such conditions arise when the component of the velocity of the aircraft in the direction of the observer is sonic. If the observer is stationary, the distance of the aircraft from the observer r is a function only of the time t'; r may, therefore, be written as a function of t' in the form :

$$r = r_0 + \dot{r}_0 t' + \tfrac{1}{2}\ddot{r}_0 t'^2 + \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Here r_0, $\dot{r}_0$, $\ddot{r}_0$ represent the distance, speed, and acceleration of the aircraft away from the observer at time $t' = O$ respectively.

If t' represents the time of full inflation of a balloon it is actually inflated between times $t'-\tau$ and $t'+\tau$, say, where 2τ is the period of inflation of the balloon. Therefore, the balloon whose disturbances reach the observer at time t can be found by solving the following equation for t' :

$$t = t' + \frac{r}{a} \pm \tau$$

or, substituting for r from (1)

$$\left(1 + \frac{\dot{r}_0}{a}\right)t' + \tfrac{1}{2}\frac{\ddot{r}_0}{a}t'^2 + \ldots = t - \frac{r_0}{a} \pm \tau \quad \ldots\ldots\ldots (2)$$

In general, for disturbances which reach the observer at time $t - \frac{r_0}{a}$ equation (2) can be approximated by :

$$\left(1 + \frac{\dot{r}_0}{a}\right)t' = \pm\tau \quad \ldots\ldots\ldots\ldots\ldots (3)$$

which shows that disturbances from all balloons whose times of full inflation lie between $\dfrac{-\tau}{1+\frac{\dot{r}_0}{a}}$ and $\dfrac{+\tau}{1+\frac{\dot{r}_0}{a}}$ will reach the observer simultaneously. If, however, the component of the velocity of the aircraft in the direction of the observer is sonic, then

$$\dot{r}_0 = -a$$

and disturbances from all balloons whose times of full inflation lie between $-\infty$ and $+\infty$ will reach the observer simultaneously ! Clearly the neglect of the t'^2 and higher order terms in forming (3) from (2) is responsible for this result, but the interpretation that should be made is that the pressure disturbances due to a great many balloons will reach the observer simultaneously when $\dot{r}_0 = -a$; in fact, by keeping in the t' term in (3), we can show that disturbances from all balloons whose times of full inflation lie between $-\sqrt{\frac{4a\tau}{r_0}}$ and $+\sqrt{\frac{4a\tau}{r_0}}$ will reach the observer simultaneously, or $\sqrt{\frac{4a}{r_0\tau}}$ times as many as for an aircraft that is stationary.

We have demonstrated, therefore, that the important parameter in the problem of the sonic bang is the component of the velocity of the aircraft in the direction of the observer. Bangs will occur when this component is sonic, as pointed out by Yates. Bangs are always liable to be made, therefore, at supersonic speeds, but their intensity will depend upon the acceleration of the aircraft towards the observer. One can construct the directions in which the component of the velocity is sonic—they will be at the complement of the Mach angle* to the direction of flight—and bangs will be experienced by all observers who lie along such lines (Fig. 1). Such lines will be termed "bang lines" : they are at right angles to what are usually termed "Mach lines."

Let us now examine our reasons for rejecting the acoustic explanation of the sonic bangs. We showed above that, compared with a stationary aircraft, the disturbances from $\sqrt{\frac{4a}{r_0\tau}}$ times as many balloons will reach the observer when the aircraft is travelling towards him at sonic speed. Treating the balloons as sources of noise this would mean that the noise reaching the observer would be $\sqrt{\frac{4a}{r_0\tau}}$ times as loud. Now an aircraft that is stationary at, say, 25,000ft will cause a noise on the ground of at most 70 decibels above the acoustic threshold, corresponding to a pressure of about 0.001 lb/ft². Taking the speed of sound $a = 1{,}000$ ft/sec, and assuming that the aircraft is accelerating through the speed of sound at only 1 ft/sec.² (i.e. $\ddot{r}_0 = 1$ ft/sec.²), then the bang, by our result above, will be 400 times as loud as when the aircraft is stationary. But the bang corresponds to at least 130 decibels (about 1 lb/ft²); a figure of 0.05in Mercury, or 3 lb/ft², has been quoted, which means that it is actually a million times as loud !

Calculations, which are a little too long to be repeated here, have shown, however, that the bang of about 130 decibels is due to aerodynamic pressure disturbances caused by the aircraft, which accumulate when it is flying towards the observer at sonic speed. No postulate about shock-waves is required to obtain this result; the fact that such waves will occur in practice will tend to reduce the bang, for shock-waves lead to losses in pressure, as any air-intake designer will confirm. Yates's second explanation is not, therefore, quite right. The disturbances emitted when accelerating through a Mach number of unity are in fact responsible for the usual second bang.

Finally, a word about triple bangs. They could be caused, as Yates points out in his acoustic explanation, by the aircraft reaching supersonic speed twice (Yates's dive No. 3). Actually, however, aircraft do not do this : their Machmeter usually reads a steadily increasing speed to a maximum value followed by a steadily decreasing speed. Triple, and likewise quadruple, bangs are probably much more likely to be caused by changes of course. We have pointed out that the important parameter is the component of velocity of the aircraft towards the observer. If, therefore, during a non-straight dive there are three occasions on which the aircraft is moving towards an observer at sonic speed, then he will, in general, experience three bangs (Fig. 2).

It should be noted that it is possible, indeed likely, that different observers will hear and report different numbers of bangs on a particular occasion. The number of bangs that one hears depends entirely upon where one is, and arguments as to how many bangs there were are, therefore, pointless.

The author is indebted to the Chief Scientist, Ministry of Supply, for permission to publish this article, but the views expressed are the author's own.

* *"Mach angle": The "angle of sweepback" of the shock waves.*

FORGING THE COMMONWEALTH CHAIN

SIR MILES THOMAS has referred on several occasions to B.O.A.C.'s plans for two round-the-world air services in the Northern and Southern hemispheres. One is to be a jet-propelled "cannon-ball" service using Comets, the other a rather slower tourist service flown by Britannias. Enquiries we have made about the details and the agreements which will have to be made with Commonwealth countries and with America have brought forth little factual information, for discussions are now apparently at even higher levels than the heads of airlines.

It seems that the matter was first officially discussed between British, Australian and New Zealand officials in Canberra. More recently Mr. Lennox-Boyd, Minister of Transport and Civil Aviation, has had talks in London with Mr. H. L. Anthony, his opposite number in Australia. Mr. Anthony will now discuss the matter with New Zealand's representative, and it is hoped that, before long, agreement will be reached and details announced.

One of the most important links of the Southern girdle service is operated by British Commonwealth Pacific Airlines, while the Australia-New Zealand link is the responsibility of Tasman Empire Airways; Britain has a 20 per cent financial interest in both. There is now talk of Qantas taking over the whole of the Pacific link, and this country might then give up its interests in both B.C.P.A. and T.E.A.L.

The important link between San Francisco and New York would be operated by B.O.A.C., who already have a bilateral agreement with America to permit this. Certainly there would seem to be good prospects for the easterly route from Australia to the United Kingdom, for a large number of air travellers prefer to cross America rather than fly over India and the Middle East. At the moment Pan American Airways carry the bulk of this traffic.

FROM ALL QUARTERS

"Flight" photograph

FIRST IN : No. 430 Squadron R.C.A.F., lined up on the tarmac at their new base in France (Gros-Tenquin), after completing their transatlantic flight last week. Nos. 416 and 421 Squadrons landed a few minutes later.

Leap Frog II Concluded

THE transatlantic delivery of 63 F-86E Sabres by the Royal Canadian Air Force ended on Saturday last with the arrival at Gros-Tenquin, near Metz, France, of Nos. 416, 421 and 430 Squadrons. Each of these units has a strength of 20 aircraft; the remaining three machines constituted the first delivery of Canadair-built Sabres to the R.A.F.

The delivery flight, which started on October 1st, was by way of Goose Bay, Labrador—Bluie West One, Greenland (780 miles)—Keflavik, Iceland (750 miles)—Prestwick, Scotland (850 miles)—Gros-Tenquin, France (655 miles).

Flying time for the 3,035 miles totalled 4 hr 40 min and the last leg from Prestwick was completed in 1 hr 15 min. The pilots were welcomed by General Jouhaud on behalf of the French Secretary of State for Air.

Gros-Tenquin is a newly constructed airfield with a 7,000ft runway. It will house No. 2 Fighter Wing R.C.A.F. and is the first of four airfields to be made available under NATO agreements to the Canadians in France and Germany.

The R.O.C. and "Ardent"

MOST urgent problem confronting the post-war Royal Observer Corps has been to develop new techniques for the earlier reporting of fast, low-flying raiders. Though the posts are still using equipment produced in the biplane era, and are manned by a large percentage of new recruits totally lacking in operational experience, Exercise Ardent—subject of reports in this issue—proved how very efficiently the problem has been tackled.

A *Flight* contributor who is an R.O.C. leading observer writes: Our own post, "Dog Three," perched atop a telephone exchange, is typical of many all over the country, except that its nearness to Northolt Airport often gives us plenty of activity to report when other posts are praying for a plot that will break the monotony. During Ardent this blessing was a dubious one, because joy-ride Rapides can be distinctly embarrassing when their arrival coincides with a skyful of Meteors, Vampires and vapour trails.

Fortunately, a full season of exercises had worked wonders with last winter's recruits, and during the four days and three nights of R.O.C. participation in Ardent, they put through plots to centre with speed and accuracy that would not have disgraced the post in its World War II heyday. And the disembodied voices of centre, both male and female, responded with eagerness and confidence that confirmed the usefulness of our plots—an important factor for the morale of posts, which do not have the same picture of the overall air battle as their colleagues at centre.

AT "DOG THREE" : Two R.O.C. members—Chief Observer R. E. Wake and Leading Observer J. W. R. Taylor—on duty during Exercise Ardent (see account above).

From the start, there was no doubt of the effectiveness of the new plotting techniques and reporting sequences, tested in brief R.A.F./R.O.C. exercises at week-ends and mid-week from April to September, but receiving their first full-scale work-out under wartime conditions in Ardent. Unofficial news flashes from centre told of low-flying jet raiders being intercepted over the Thames Estuary on their way to the target; and we had exciting grandstand views of the same "enemies" being destroyed by Fighter Command—for the second time—over West London on the way out.

Nor were "hostiles on the deck" our only important customers during Ardent, for we had plenty of practice in plotting high-flying aircraft up to 30,000 ft, with the added satisfaction of knowing that *our* plots were not affected by wholesale showers of "window" dropped by the bombers. Similarly, the long night duties gave valuable experience in sound plotting.

We may never be told officially the percentage of interceptions achieved by fighters as a result of our modest efforts in the exercise. But we do know that Fighter Command, of which we are proud to be members, thought we put up a good show—and that is all that really matters.

H.M.S. "Formidable" to be Scrapped

LAUNCHED a month before the outbreak of World War II, the 23,000-ton fleet carrier H.M.S. *Formidable* is to be scrapped. In making this announcement, the Admiralty says that only by a complete modernization could the vessel be made suitable for operating modern aircraft, and now that H.M.S. *Eagle* is in service and H.M.S. *Ark Royal* is building, the cost of such a conversion would not be justified.

The *Formidable* has a distinguished war record: her aircraft helped to cripple the Italian fleet at Matapan, she provided air cover for the Salerno landings, and with her sister ship *Illustrious* she ferried more than 800 R.A.F. aircraft to operational zones. In the Pacific war, she took part in attacks on the Japanese mainland and was twice hit by Kamikaze aircraft. It was from *Formidable* that Lt. R. H. Gray, D.S.C., R.C.N.V.R., flew off to destroy a Japanese destroyer in the face of deadly fire, a feat which earned a posthumous **V.C.**

Rolls-Royce Canadian Directors

AT a recent meeting of Rolls-Royce of Canada, Ltd., held at the new head office and factory on Côte de Liesse Road in Montreal, Mr. John Fuller and Mr. J. A. Boyd were appointed to the Board. The meeting, held under the chairmanship of Brigadier the Hon. Hugh Kindersley, deputy chairman of the parent company, was a milestone for Rolls-Royce in Canada. It was the first directors' meeting at the new factory, where the company will soon manufacture and assemble Nenes to power the T-33 trainers being built for the R.C.A.F. by Canadair, Ltd.

The D.H.110 Accident

THE appeal by the Royal Aircraft Establishment for eye-witness accounts and photographs of the accident to the D.H.110 at the S.B.A.C. Display on September 6th has met with a wide response. Unfortunately the majority of the films and photo-

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28

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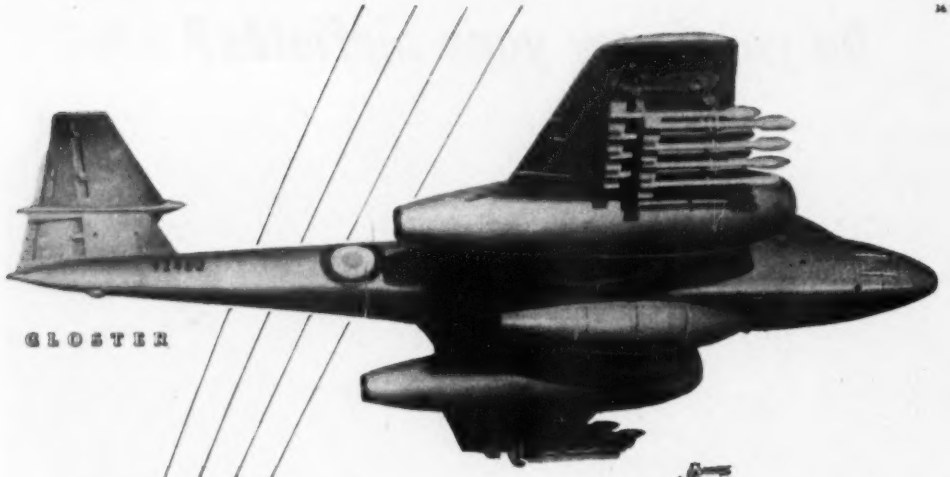
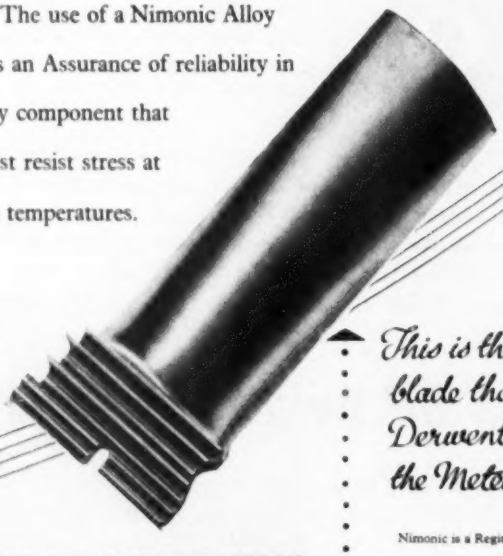


One good trademark leads to another

Every British aircraft gas turbine has rotor blades made of one or another of the Nimonic Series of Alloys. The use of a Nimonic Alloy is an Assurance of reliability in any component that must resist stress at high temperatures.



This is the Nimonic 80A turbine blade that rotates in the Derwent engines that keep the Meteor flying

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FROM ALL QUARTERS . . .

graphs submitted were taken after the break-up of the aircraft had commenced.

The Director of the Royal Aircraft Establishment, South Farnborough, Hants (the Establishment is investigating the accident in conjunction with the Inspector of Aircraft Accidents, Ministry of Supply), is anxious to secure photographs of the aircraft immediately preceding the break-up, and during the high-speed run after the dive from altitude.

B-29 Missing

THE U.S. Far East Air Force was last week searching for a B-29 Superfortress which, they said, was missing off the Japanese island of Hokkaido. The aircraft had been tracked by radar as normal procedure, and a second "blip" had been sighted in the same area. The two traces coincided, whereupon a distress call in English was heard, followed by silence. At the same time, a four-engined aircraft was reported to have crashed in Russian waters off the Kurile Islands.

For Rapid Rescues

SPEED is but one of the many good features of the latest R.A.F. crash rescue tenders, built by Vosper, Ltd., of Portsmouth, two of which were given their first public demonstration last week. In these 46ft craft two 375 h.p. Rover V-8 engines give a normal maximum speed of 29 knots, or 32-33 knots for brief periods. We expect to make further reference to the performance and equipment of these fine craft in an early issue.

Another Pulqui Lost

A NENE-POWERED Pulqui 2, of the type standardized by the Argentine Air Force, was destroyed on an experimental flight last week, killing the pilot, Otto Behren, a veteran of the Luftwaffe. The prototype Pulqui 2 was demonstrated by its chief designer—Kurt Tank of Focke-Wulf fame—before President Peron last year. This prototype was similarly lost on a test flight. Built by the Argentinian Instituto Aerotecnico, Cordoba, the Pulqui (Arrow) 2 superficially resembles the Mig-15.

Percival Helicopter

IN a lecture before the Hiller Management Club, reprinted in *American Helicopter*, Dr. J. A. J. Bennett, formerly head of the helicopter department of the Fairey Aviation Co., Ltd., has stated that the Percival company has a contract for an experimental jet project of less than 2,000 lb gross weight, "without tip burning." The fuel consumption, he remarks, should thereby be halved.

Although construction of the machine referred to by Dr. Bennett is believed to be well advanced, no official announcement is expected before the middle of next year.

New Armstrong Siddeley Director

THE appointment of Mr. W. H. ("Pat") Lindsey, M.A., F.R.Ae.S., to the board of Armstrong Siddeley Motors, Ltd., is announced. As chief engineer, Mr. Lindsey is responsible for all design and development of Armstrong Siddeley aero engines, including their building, performance calculation, installation and air and ground testing. Born on November 19th, 1911, he was educated at Selwyn College, Cambridge and, after training as an Armstrong Siddeley post-graduate apprentice, was made an assistant in the research department in 1934. From 1940-45 he was research engineer in charge of the research department, and became deputy chief engineer during 1945. He was promoted to his present position in the company five years later.

Mr. W. H. Lindsey.

The Motor Show

THE London Motor Show, which opens at Earls Court on October 22nd, is to our associate journal *The Autocar* as the S.B.A.C. Display at Farnborough is to *Flight*. Three much enlarged special numbers of *The Autocar* are being published : the first, Show Guide, today, October 17th (price 1s); the second, Show Report, on October 24th (price 1s 6d); and the third, Show Review, on October 31st (price 1s).

The three titles are, in part, self-explanatory, but it may be mentioned that the first is in the nature of a buyers' guide; the second will describe in particular the latest features of the new cars; and the third will contain a technical survey of the year's progress in design. Apart from their immediate interest in connection with the Show, all three issues will serve as useful works of reference for many months to come.

G.A.P.A.N. INSTALLATION and PRESENTATIONS

A VERY enjoyable occasion was the annual installation ceremony, presentation of trophies, and conversazione of the Guild of Air Pilots and Air Navigators of the British Empire arranged at the Innholders Hall, College Street, London, on Thursday, October 9th. Mr. J. Lankester Parker, O.B.E., F.R.Ae.S., was re-elected Master for the second year. The Court Wardens and Assistants were installed, and the appointment of two new Honorary Wardens, Mr. H. O. Short and Sir Francis McClean, was announced. The Master then gave his address.

W/C. B. T. Aikman received the Brackley Trophy.

It is possible that the Guild may become a Livery Company of the City of London, and the opinions of the members are now being sought on the subject. Certain changes would be involved, including the adoption of a new constitution and by-laws which must have the approval of the Lord Mayor and Aldermen of the City of London. Such a draft has already been completed. It was following a unanimous decision by the Court of the Guild in September, 1951, that an approach was first made to the City authorities with a view to obtaining their approval. These matters were briefly referred to by the Master in his address, but any decision must now await the views of the members of the Guild.

After the Master's address two Guild trophies, the Brackley Trophy and the Johnston Memorial Trophy, were presented. It will be recalled that the Cumberbatch Trophy, which was won this year by Tasman Empire Airways, Ltd., was presented at a special ceremony at Londonderry House on September 11th.

The recipient of the Johnston Memorial Trophy was Captain P. G. Taylor, of Sydney, Australia, director of Trans-Oceanic Airways. This trophy, it will be remembered, is presented in memory of S/L. E. L. Johnston, Air Navigator and first Deputy-Master of the Guild, and it is awarded for the most outstanding feat of aerial navigation on civil flights involving the development of the technology of navigation. According to the citation this trophy is awarded for a second time to Captain Taylor—

> "for his further outstanding work in air navigation and in particular for his survey flight to prove the practicability of operating a service between Australia and South America. The hazardous 8,000-mile flight from Australia to Chile was made by way of Suba, Aitutaki (Cook Island), Tahiti (Society Islands), Mantareva (Gambia group), Easter Island and Valparaiso, and the overall time for the return journey was five weeks."

The trophy was received on behalf of Captain Taylor by the Hon. T. W. White, High Commissioner for Australia.

W/C. Barry Aikman, D.F.C., F.R.Met.S., chairman and managing director of Aquila Airways, received the Brackley Trophy, which is awarded annually to a British subject or subjects within the Commonwealth for the most outstanding achievement concerning improvements in the operation of flying-boats; this may be either theoretical or practical in connection with the organization, flying or navigation of flying-boats or services, but not in connection with design or construction. The citation reads :—

> "During the past five years, Mr. Aikman has built up and operated a flying-boat service between England and Madeira, with an extension to the Canary Islands, with a record of complete safety. He has also been the sole British operator of flying-boats on charter flights to all parts of the world, the most notable being to the Falkland Islands. Mr. Aikman has, by his skill and enterprise, made a considerable contribution to the technique and economies of flying-boat operation, and, moreover, during a period of great difficulty from the point of view of the independent operator. Although the award has been made personally, Mr. Aikman has asked that the work of his colleagues and employees in Aquila Airways should not go unacknowledged."

HIT AN' GIT is the latest helicopter operational technique evolved by the U.S. Marine Corps. Briefly, this entails delivering rocket launchers to selected points and getting in a few salvoes before counter-artillery action can be taken. Once the salvoes have been discharged the still-hot rocket launcher is hooked on to the helicopter and flown away to safety, or to another selected site, complete with its crew. The type of machine used is the HRS-1, the U.S. Marine Corps equivalent of the Westland-Sikorsky S-55, and one of these is seen in the left-hand picture lowering a launcher to the ground. On the right, a rocket battery is glimpsed in action.

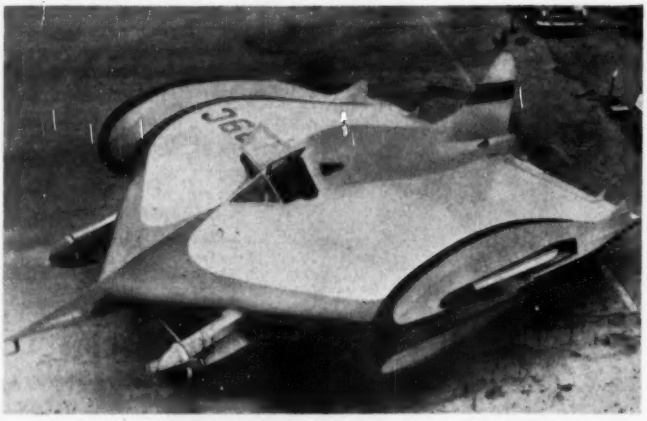
HERE AND THERE

Target Simulator

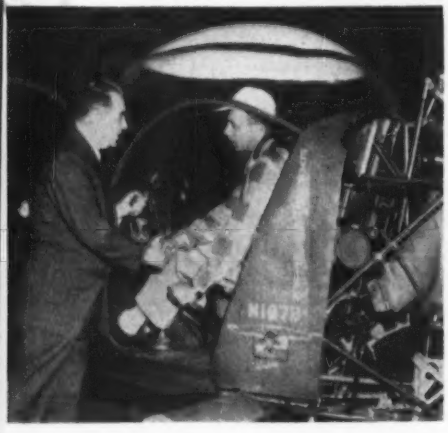
RESEMBLING certain German fighter projects in having a very deep forward body, nose intake, ventral outlet and sharply swept, untapered surfaces, the recently announced Ryan Q-2 is a jet-propelled pilotless target "drone" intended for anti-aircraft training and for fighter interception exercises. A joint U.S.A.F.-U.S. Navy-U.S. Army project, it is designed to fly at near-sonic speed.

Target Seeker

THE U.S. Army has announced that a guided missile which can track down and destroy an aircraft ten miles away at a height of more than six miles will be used to defend certain areas of the United States. Units equipped with the new weapon are expected to be formed next year, and the missiles are ready to be turned out on a production-line basis. Intensive study is said to be under way to determine which areas of America will be defended by the missile units.



IT FLIES: This creation is reported to have risen to a height of ten feet during taxying trials at the Orange County Airport, California. We presume that its designer, one Bill Horton (who describes himself as a "former" aircraft engineer), is no relation to the famous German firm of Horten, who were renowned for their all-wing aircraft.



NON-STOP: Elton J. Smith is congratulated by Lawrence D. Bell, president of Bell Aircraft Corporation, after his recent 1,234-mile flight in a 47D-1 from Fort Worth, Texas, to Niagara Falls—an expected helicopter distance record.

King George VI Fund

LAST week we drew attention to the aims of the King George VI National Memorial Fund, and in this issue—on page 14—will be found a post-free donation form which will assist readers in making their response to the appeal.

Another for Hayhow

IF T. W. Hayhow's latest light-aircraft record is confirmed it will be his twenty-eighth. On Sunday last, October 12th, he flew his Aiglet Trainer from Kastrup Airport, Copenhagen, to Fair Oaks Airfield, Surrey, in 4 hr 21 min 45 sec, representing an average speed of 136.34 m.p.h.

Close-up (or Down)

A COMET chartered to take film actress Ann Todd and her husband, director David Lean, to Paris for the French première of *The Sound Barrier* last week caused a sensation when it flew low—reportedly at between 1,200 and 1,500ft—over the capital. For many Parisians this was the first near view of one of Britain's jet airliners.

John Cobb Memorial Service

A MEMORIAL service to the late John Cobb will be held in St. Michael's Church, Cornhill, London, at 12 noon on Friday, October 31st.

A.T.A. at St. Paul's

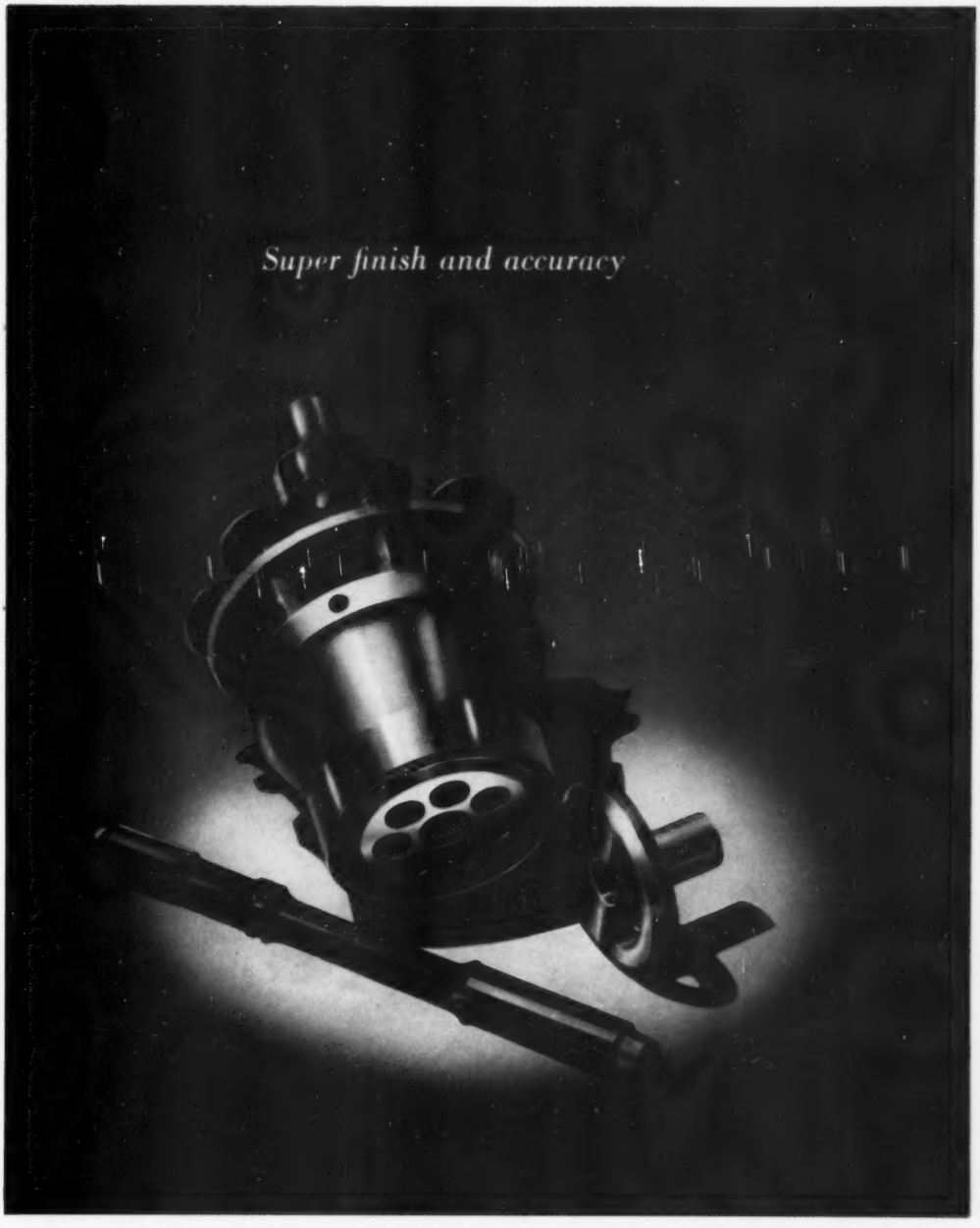
EX-MEMBERS of Air Transport Auxiliary, in uniform, are to assist in the Evensong service at St. Paul's Cathedral on Remembrance Sunday, November 9th.

Helicopter Milk-run

AUSTRIAN cheese-producers hope to use helicopters for transporting milk—at 80 gallons a time—direct from the high mountain pastures to the factories in the valleys.

Pacific Chart Revision

THE Magnetic Survey division of the Department of Scientific and Industrial Research is planning to revise charts covering a large area of the Pacific Ocean. Mr. A. L. Burrows, of the division's Christchurch staff, recently left to make observations on a number of Central



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HERE AND THERE . . .

Pacific islands, including Norfolk, Fiji, Samoa, Aitutaki, Rarotonga, and Bora Bora. Mr. Burrows has already set up a magnetic observation station at Nandi Airport, Fiji, and intends to establish stations on all the airports he subsequently visits.

American Jet Flying-Boat

MULTI-ENGINED, large, very fast and "not a fighter" is the description of the Martin Model 275 Seamaster pure-jet flying-boat, for which a contract has been placed by the U.S. Navy.

Royal Dutch Visit

A RECENT visit was paid by H.R.H. Prince Bernhard of the Netherlands to the Supermarine Works of Vickers-Armstrongs, Ltd., at South Marston and Southampton. He was accompanied by General Aler, Chief of the Netherlands Air Staff, and at Southampton was shown the Supermarine 508 naval fighter.

Future Champion?

AT Long Mynd, Salop, recently, Christopher Wills, 20-year-old son of the international gliding champion, Philip Wills, made his first solo soaring flight. He was airborne for one hour and ten minutes, and climbed to 1,600ft in one of the standing waves over the Mynd. His "C" certificate, requiring five minutes' soaring flight, was consequently awarded.

C-130s Ordered

ALTHOUGH the prototype has not yet flown, a production order for an unspecified number of Lockheed C-130A turboprop cargo aircraft, for service with the U.S.A.F., has been placed. The aircraft will be built at the company's factory at Marietta, Georgia, where at present B-47 turbojet bombers are being produced. The number of employees at the factory is expected to rise from the present figure of 11,500 to more than 15,000 by mid-1954.

Aerial Inequality

IT has been proposed by Central African Airways that fares for women passengers on the company's projected tourist service to London should be less than those for men. Two reasons are given, firstly that women, in general, have lower incomes than men, and secondly, that the weight of the C.A.A.-assessed female is 143 lb, while that of the male is 165 lb. A proportionate reduction of some 13 per cent of the man's fare is therefore suggested.

EXPRESS DELIVERY: The three pilots of Transport Command Overseas Ferry Unit who (as reported in last week's issue) recently delivered F-86E Sabres for the R.A.F. from the Canadair plant at Montreal: (left to right) F/L. H. Edwards, S/L. T. Stevenson and F/L. H. Deffee. They are pictured on arrival at North Luffenham, where they are training fellow-pilots in Sabre handling technique preparatory to further delivery flights. Most of the Unit's pilots, including those illustrated, were until recently engaged in flying Vampires between Singapore and their base at Abingdon—a journey of 8,680 miles.

IN BRIEF

TO expand the markets for his company's compressed air equipment, Mr. D. A. Higgs, engineering sales manager of the Hymatic Engineering Co., Ltd., of Redditch, Worcs., will shortly leave by air for an intensive five-week tour of the United States and Canada.

* * *

The unexcelled quality of the "Britool" socket, and other wrenches made by Jenks Brothers, Ltd., of Wolverhampton, is matched by the standard of the company's latest catalogue in which the extensive range of these items is described.

* * *

From Birmingham Aluminium Casting (1903) Co., Ltd., Dartmouth Road, Smethwick 40, Birmingham, comes an entirely new edition of *Birmal Data*—a guide to the selection of suitable casting alloys in aluminium, magnesium, and zinc.

* * *

Obscure indeed is the metal "gen" not contained in the 448 pages of *Metal Industry Handbook*. 1952. Published by The Louis Cassier Co., Ltd., Dorset House, Stamford Street, London, S.E.1, it is associated with the weekly journal *Metal Industry*, and is included in the annual subscription of £2 12s. to that journal.

A new leaflet from Hellermann, Ltd., of Crawley, Sussex, describes the company's "Multi-way" cleats, designed to accommodate a wide range of cables or pipes with rapid installation and removal.

* * *

The directors of the Bristol Aeroplane Co., Ltd., have declared an interim dividend of 5 per cent (subject to income tax) on the ordinary stock, payable on November 1st, 1952.

* * *

Skyways, Ltd., announces that as from October 1st, 1952, Mr. David Groom is no longer in charge of the company's affairs in Hamburg. A successor will be appointed shortly.

* * *

Mr. H. A. Springer, A.M.I.E.E., has been appointed contracts manager of Sangamo Weston, Ltd. Mr. Springer has held various positions in the manufacturing and contracts departments since joining the firm in 1932.

* * *

The Quasi-Arc Company, Ltd., of Bilston, Staffs, have produced an illustrated booklet, reference IB3, giving instructions for the installation, operation and maintenance of their A.C. portable arc welding plant, type ACP 300. It includes circuit diagrams and installation and inspection recommendations.

* * *

Mr. Orlando Oldham has joined Oldham and Son, Ltd. (manufacturers of storage batteries and portable lighting equipment) of Denton, Manchester. He is the only son of the chairman, Mr. John Oldham, O.B.E., J.P., who shares with his brothers, Mr. George Oldham and Mr. Edward C. Oldham, the managing directorship of the company.

* * *

The contract for an aerial survey of Pakistan, which it is anticipated will take four years to complete, has been awarded by the Canadian Government to the Photographic Survey Corporation, Ltd., of Toronto. As part of their economic assistance to Pakistan under the Colombo Plan, the Canadians decided to provide the country with an inventory of its natural resources by means of an aerial survey.

OPEN DAY at the Fulmer Research Institute at Stoke Poges, Buckinghamshire, was the subject of a report in the preceding issue. Here, Sir Frederick Handley Page is seen addressing the assembly; with him on the platform are Lord Waverley, Sir William Stanier (director of Fulmer Research Institute), and Mr. E. A. G. Liddiard (director of research, Fulmer Research Institute).

ARDENT—THE THREE PHASES . . .

Sunday strafe : Church Fenton Meteors beat up the Bofors guns of a Territorial L.A.A. S.L. Battery from Sheffield.

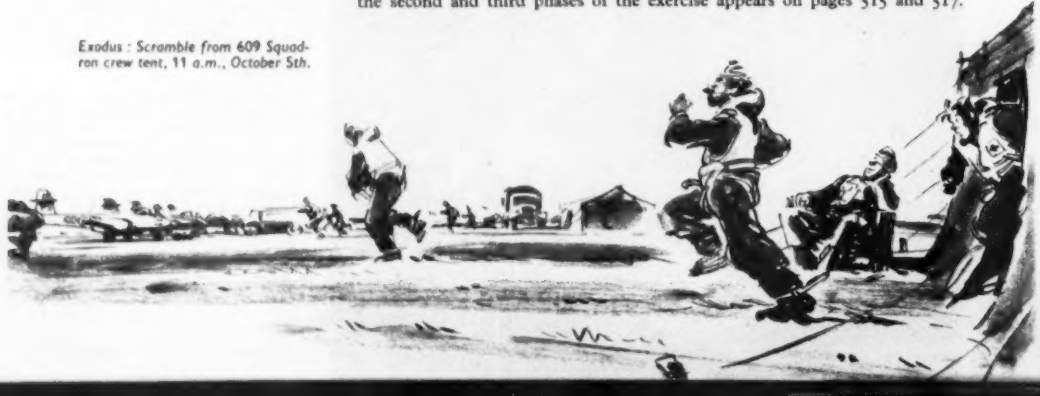
OBJECTS of the EXERCISE

Waddington watchdog : Corporal Moult, R.A.F. Police, who shadowed the artist.

One, occasional two : Dive brakes retain a fitter in place on a Waterbeach Meteor heading hangar-wards.

NEITHER the uncompromising glares of M.P.s nor the peepings of the just-curious deflected *Flight*'s artist, Gordon Horner, from his purpose of capturing the atmosphere of Exercise Ardent. In Phase I (October 4th-5th) he called at Church Fenton, Waddington, Waterbeach and Coningsby, and his felicitous impressions from these stations are here presented. The same phase was covered by five members of the editorial staff, and their narratives and first-hand experiences were published last week. In the present issue an account of the second and third phases of the exercise appears on pages 515 and 517.

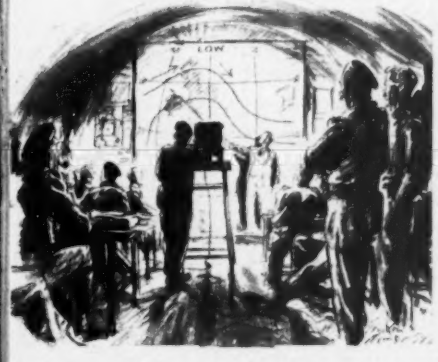
Exodus : Scramble from 609 Squadron crew tent, 11 a.m., October 5th.



Just his cup: F/O. Desmond Taylor, Waterbeach Meteor pilot, takes refreshment at the end of Phase I.

So-long!: Lincoln RF335, ex-Waddington, Friday/Saturday night.

(Right) Time expired: Replacing an engine in Washington WF506 at Coningsby on October 4th.



(Above) Midnight briefing: Lincoln crews at Waddington.

One for the road: A Waddington Lincoln is fuelled for its first sortie.

COMETS I, II, III and . . .

Deliveries and Services To-day: Production Plans First Details of Series III

ON September 30th the ninth B.O.A.C. Series I Comet was delivered at London Airport more than fifteen months ahead of the contract delivery date. Deliveries of Series IAs ordered by Canadian Pacific Airlines, Union Aero Maritime de Transport, the Royal Canadian Air Force, and Air France will now follow on at once until the total order for nineteen Comets has been completed.

Last Tuesday B.O.A.C. inaugurated its third Comet service—to Singapore. This will be operated twice weekly from the end of the month. On the three routes to Johannesburg, Colombo and Singapore, Comets will then be flying more than 80,000 miles per week. Towards the end of next year deliveries of B.O.A.C.'s Series II Comets will begin. Deliveries of Comets from Short's Belfast production line are expected to commence during 1954.

In view of the large amount of publicity which has been given to the possibility of American orders for the Comet, both in the British and North American press, the de Havilland company have made an official statement on the future of the Comet, the major part of which is printed below. They have also released the first official details of their plans for the Series III Comet. The statement makes clear the sort of considerations which have been borne in mind when deciding upon the rate and scale of production to be undertaken and in determining the times at which the succeeding later marks of Comets can be introduced.

The details of the Series II Avon Comet, of which a prototype has now been flying since February 16th, are now fairly well known. (We were surprised to learn that some overseas operators prefer to regard this particular prototype aircraft as a Series I with Avon engines.) Apart from the more powerful Rolls-Royce axial turbo-jets, production aircraft will have a slightly longer fuselage and a layout to accommodate at least six more passengers. The initial a.u.w. will be 115,000 lb; cruising speed will be a little higher than for the Series I; and the operating heights will probably be on average 2,0coft higher.

Of particular importance to the operator will be the considerably increased stage lengths which the Comet II will be able to handle, together with the increase in passenger accommodation. It is planned to build a large number of Series IIs to fulfil orders already placed or under negotiation, and many operators realize the advantage of gaining experience during the four-year period between 1954 and 1957 while deliveries of the latest Series III are awaited. The manufacturers state that the value of six years of work already put into the Comet cannot be over emphasized, and they add that it will be possible to build into the Series II a great deal of the experience and knowledge gained with the Series I.

There has been a good deal of speculation regarding the appearance, performance and capacity of the Series III Comet, and some unofficial, not entirely accurate, figures have been quoted recently. At this stage it can be confirmed that the fuselage will be considerably longer, but that the basic wing structure will be unchanged except for the necessary strengthening to meet the new all-up weight of 145,000 lb. Obviously the manufacturers will do all they can to minimize the alterations in jigging and tooling required for Series III production. The de Havilland company's views on the relationship between an aircraft's wing area and high-altitude performance are well known, and it seems certain that the wing area will be increased somewhat on the Series IIIs in order to keep the wing loading approximately the same as for previous marks. Again, the all-up weight/power ratio will be about the same, so there is not likely to be more than a slight increase in normal operating altitudes.

It is officially announced that the four Rolls-Royce Avon engines to be used in the Series III Comet will be civil versions giving 9,000 lb thrust. With their aid the cruising speed will be at least 500 m.p.h., and the practical stage length, taking into account all the normal reserves, is estimated to be 60 per cent greater than in the case of the Series I. Specific operating costs will be appreciably lower, both with the 58-seat first-class passenger layout and for the 78-seat tourist-class accommodation. There will be time to incorporate in the detailed design of the Series III all the lessons and experience gained so far with the earlier aircraft, and although these pure-jet airliners have come to be accepted as a normal and natural development, it is felt that there is no short cut to constructional and operational know-how.

One potential customer has indicated that no guaranteed Series III figures are likely to be available until the beginning of next year, and expressed the opinion that the estimated stage-length figures are somewhat disappointing. To quote de Havilland's range figures with capacity payload and adequate fuel allowances, the Series Is can handle stage lengths "of up to about 1,750 miles"; the Series IIs stages "up to 2,500 miles"; and Series IIIs (estimate based on Series I) about 2,800 miles. At the present time the longest stage length flown by B.O.A.C. with their Series Is, carrying the full passenger load of 36, is 1,360 st. miles—from Rome to Beirut. However, take-off conditions and prevailing winds are even more important than range alone.

The first production Series III aircraft are scheduled to appear late in 1956, the first prototype having flown during 1954. During 1957 the production rate is expected to average approximately four per month.

THE FUTURE of the COMET—a de Havilland Statement

AN interesting phase is reached now that the Series I Comet has been in public service for five months (since May 2nd) and now that the capabilities of the Series II are beginning to emerge from the trials which began on February 16th. Confidence in the practicability and economic value of jet propulsion in public transport is now becoming solidly established, and interest in the Comet has become much more serious, as it was expected to do at the present stage.

B.O.A.C., whose boldness and foresight did so much to bring the Comet into being, are showing a broad-minded attitude by championing the aircraft among their international competitors, preferring to see the benefits of the new form of propulsion become generally available rather than endeavouring to keep them to themselves.

Only twenty-one of the Series I and IA (including the two development aircraft) are being built, and already production of the Series II is getting under way. Larger sales of the Series I were not to be expected because it was known that improved versions were likely to be available at a relatively early date, also because airlines were fairly well stocked with new fleets after the war, and because operators needed convincing of the merits of jet propulsion. Now that their confidence is growing they are still faced with the problem of whether to purchase the Series II Comet, a 44-passenger world airliner for delivery in 1954 and onwards, or to wait for a 58-78-passenger Series III Comet in 1957 or even later developments.

The rate of production of Comets has been in pace with the attitude of the operators, and considerably in excess of orders in hand. The degree of excess production beyond positive orders is a matter for most careful judgment, not only as a commercial risk but also from the point of view of locking up productive facilities, effort and material, and thus delaying the introduction of the improved versions.

It is the demand from the operators which governs production. Trunk-route airliners cost more than half a million pounds apiece, and operators could not introduce Comets to replace good existing airliners unless assured of sufficient extra profit from the Comets to make good the premature write-off of their investment. On the other hand, world traffic is increasing and fleets must expand, and operators see the wisdom of gaining experience in jets with the Comet II.

The de Havilland company has developed and held in readiness schemes for rapid expansion when the orders justify it. Thus, when an operator spoke of 50 Comet IIs in the year 1955 de Havilland undertook to supply that quantity in addition to orders already taken, provided a contract was placed without delay. De Havilland also offered to commence deliveries of the Comet III late in 1956 and to supply at a rate rising to six a month in about two years. These offers, made publicly early in September, may be taken by airline operators the world over as a useful indication of the Comet outlook for the important period leading up to the time when competitive aircraft may commence to appear in service.

FORTHCOMING EVENTS

Oct.	17.	Institute of Navigation: Annual General Meeting, and Presidential Address by Rear Admiral A. Day, C.B., C.B.E., D.S.O.
Oct.	25.	S.L.A.E.: Film Show.
Oct.	28.	Aircraft Recognition Society (Plymouth Branch): Second 1952-3 Lecture Meeting and Recognition Contest.
Nov.	7.	Helicopter Association: "Operational Future of the Helicopter," by P. G. Masefield, M.A.(Eng.), F.R.Ae.S.
Nov.	8.	British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Nov.	12.	Institute of Transport: Anniversary Luncheon.
Nov.	19.	Royal United Service Institution: "The 'Bismarck' Operation in the Light of German Records," by Cdr. R. F. Jessel, D.S.O., D.F.C., R.N.
Nov.	21.	Institute of Navigation: "The Vertical Reference in Navigation," by W. A. W. Fox and D. Barnett.
Nov.	25.	Society of Instrument Technology: Symposium on "Control Valves." Papers by A. R. Aikman, B.Sc., H. R. Walton, B.Sc., A.M.I.Mech.E., and B. W. Balls, B.Sc., A.M.I.Chem.E.
Nov.	29.	S.L.A.E.: "The Bristol Proteus Gas Turbine," by D. Dekkers.
Dec.	3.	Royal United Service Institution: "The Air Battle," by Air Chief Marshal Sir Robert Saundby, K.B.E., C.B., M.C., D.F.C., A.F.C.
Dec.	5.	Helicopter Association: "Simulation of Flight Loads by Ground Tests," by M. J. Brennan, B.Sc., and R. Hafner.

FACTS ABOUT THE GLOSTER JAVELIN / *Super Priority for the R.A.F.*

Point of Stall

High speed aircraft are often suspected of early stalling. The Delta Wing however, on the Gloster Javelin, enables this mighty fighter to land at low speed and its positive control characteristics to the point of stall are outstanding.

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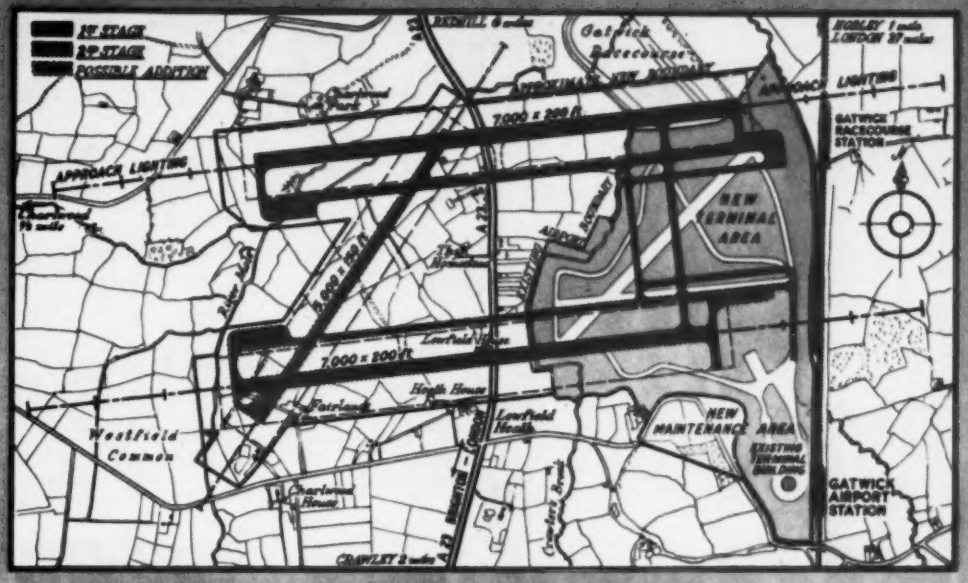
The DE HAVILLAND CHIPMUNK

joins the regular Royal Air Force

Chipmunks over the R.A.F. College, Cranwell.



Both present and future form of Gatwick Airport are shown in this new "Flight" map.

DEVELOPING GATWICK

—as a New Airport for London: M.C.A. Plans Announced

As announced last week, Gatwick has been selected by the Ministry of Civil Aviation as the most suitable site for a new terminal airport in the London area, and plans for its development have been put forward. There are, it is stated, three primary reasons for building a new major airport for London: (1) Traffic is expected to increase beyond the planned capacity of London Airport itself. Last year London Airport and Northolt handled over 1¼m passengers and the number of transport aircraft movements in the area is expected to have been doubled by 1960. London Airport is being expanded, but, even so, will not be capable of handling all the traffic expected. (2) There is a need for an alternative airport with a ready access to London. (3) Such an airport would not only have to be a suitable base for some of the regular southbound services, but would have to be capable of taking all the types of aircraft normally using London Airport. Gatwick was chosen from over 50 sites.

As it stands, Gatwick is a relatively small civil customs airport, requisitioned and operated by the M.C.A., and capable of handling aircraft of up to 10,500 lb all-up weight. It is used by civil charter companies and by helicopters of the B.E.A. experimental unit. There are two P.S.P. runways of 4,200 and 3,600ft respectively, and one grass runway of 3,600ft. Customs, immigration and medical services are provided, and there are good facilities for overhaul and maintenance of aircraft. The airport is situated five miles south of Redhill and 27 miles from London, and has its own railway station and another on its north-eastern boundary on the electrified London-Brighton line, providing quick and regular train connections with the capital.

Proposals for developing Gatwick centre upon the construction of two 7,000ft by 200ft runways running parallel with one another from east to west; a third subsidiary runway of 5,000ft might later be laid from north-east to south-west. This layout, it is stated, is designed to cause the minimum disturbance to local amenities and properties, so that the approach and take-off paths would for the most part be over open country. The logical site for the new passenger and freight buildings and airline offices would be between the runways, and the area chosen—on the eastern side—is adjacent to the existing Gatwick Racecourse station. Under the new plan, the present terminal area in the S.E. corner of the airport would be devoted to the maintenance and servicing of aircraft. Construction of the new runways would involve the diversion of the London-Brighton road (A.23).

The first phase of reconstruction, scheduled for completion by 1956, involves the building of the northern main runway, together with the necessary taxiways, and of aircraft parking space, the main traffic handling buildings and the first group of hangars in the maintenance area (work on these buildings is not expected to begin before 1954). The second stage consists of construction of the other east-west runway and the subsidiary runway and further taxiways, parking space and hangars; this phase would not begin before 1958.

Among the advantages of the scheme are Gatwick's direct rail link with London (although initial difficulty might be experienced in dovetailing "special" and regular services) and the fact that it is an existing airfield with several useful buildings as opposed to an undeveloped site; the distance by road, however, is an unfavourable feature. Apart from the Surrey Hills, 7-8 miles to the north, and the railway embankment which forms the eastern boundary, the air approaches are good. The district enjoys comparatively good weather and visibility is rarely affected by industrial haze. From the operator's point of view the reduction in air distances to all points south and east is a further advantage.

The area is not heavily populated and the maximum number of houses to be demolished as a result of the development programme has been given as 50 by the M.C.A. Although the Gatwick proposals have caused a number of local protests, there were bound to have been objections whatever site was selected. After discussions with the M.C.A., the Crawley Development Corporation are reported to have expressed the belief that present and future inhabitants of Crawley would accept the proposal when they were convinced that it was in the national interest, and that great care had been taken at every stage to ensure that nuisance and risk were minimized; such care, they felt, had been taken.

A new Aerofilms study of London's river, showing the cleared South Bank area beyond Hungerford Railway Bridge, and the Waterloo Gate (lower corner of site). Waterloo Station is on the left and Westminster Bridge and the Houses of Parliament, top right.

FESTIVAL AIR STATION

Plans for the Waterloo Terminal—B.E.A.'s Improved City Centre on South Bank Site

THE recently published annual report of B.E.A. contained the first announcement of the corporation's plans to acquire a larger London air station than the existing premises at Kensington, which, in the words of Lord Douglas of Kirkleside, "is now bursting at the seams." After an extensive survey of London, and lengthy negotiations with the L.C.C., it was decided to develop a corner of the Festival of Britain site at Waterloo as a terminal capable of handling 14,000 passengers daily—twice the capacity at Kensington. The new site has several attractions, not the least of which is that it might eventually become the focal point of B.E.A.'s projected network of inter-city helicopter services. Tests on the spot with S-51 and Bristol 171 helicopters have, in fact, been carried out to the satisfaction of the Corporation; the L.C.C., however, has made it very clear that it will not necessarily agree to further trails or experimental services.

To be known as Waterloo Air Terminal, B.E.A.'s new city centre is directly connected by escalator with the main surface and underground railway services operating from Waterloo Station. Work has already begun on extending the ground floor of the Station Gate building, the principal building of the three-acre terminal site, and an additional storey will be added to the west side to increase floor space. Adequate parking capacity will be provided in two separate areas—for coaches and for taxis and private cars. Passengers' arrival and departure halls will be situated on the west side of terminal in a turning off York Road, which separates the terminal from the main railway station. On the mezzanine

floor there will be a waiting room and buffet, which will be open to the public.

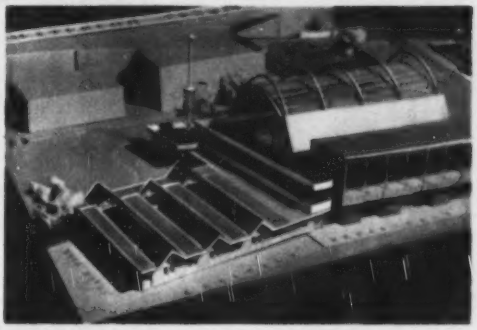
Although the Waterloo Terminal is slightly farther from Northolt and London Airport (but nearer to Gatwick) than Kensington Air Station, its central position in relation to the main network of London's public transport services should more than compensate for the additional ten or fifteen minutes spent in the coach. Hungerford Bridge provides direct rail and foot connection with Charing Cross Station, which is a main terminal for steam and electric rail services, and an intersection in the Underground system. Discussions are already being held between B.E.A. and the British Railways Executive on the prospects of frequent and direct electric rail services between Waterloo and Gatwick.

The Corporation hold a seven-year lease on the new terminal building, which is of modern and attractive design, and intend to open it next spring.

Careful consideration has been given to the possibilities of building a rotorstation for helicopters behind the terminal site, and at least one man who is well qualified to give an opinion has stated that the base of Hungerford Bridge would probably be very suitable for the purpose. This would permit helicopters to approach along the river—there are several advantages in this both for normal operations and in case of emergency—and it could scarcely be argued that anything could spoil the appearance of Hungerford railway bridge. Earlier proposals for a rotorstation at Waterloo Bridge had met opposition on the grounds of appearance.

During the recent helicopter trial flights into the South Bank site a careful measurement was made of noise. There is little doubt that if these machines are to operate over the city adequate silencing will be demanded, and it therefore seems unlikely that the close proximity of the Festival Hall could form a reasonable objection on grounds of noise to the introduction of a rotorstation at Waterloo.

Experimental landing on the South Bank site (Waterloo Station in background) by one of B.E.A.'s Sikorsky S-51 helicopters.



Arrival and departure extensions to the main Gate building are shown in model form. Design of the new terminal is in the hands of Sir John Burnet Tait and Partners.

The disposition of B.E.A.'s new London terminal building, due to open next spring, has been superimposed on this vertical view of the Waterloo area; for added clarity, the area of the South Bank site has been emphasised. Hungerford and Waterloo Bridges are visible at upper left.

An early Eagle-engined specimen of the D.H.4 with the short undercarriage and with the Scarff gun ring mounted directly on the top longerons.

THE DE HAVILLAND D.H.4

No. 1 of the Series

By J. M. BRUCE, M.A.

For this initial study in a special "Flight" series to be devoted to famous British military aircraft, the subject is one of the most significant bombing and general-purpose aircraft of all time—the Mosquito of its day—the D.H.4.

IT is not surprising that, in the first major war in which aircraft were used, it was some little time before the strategy of aerial warfare was evolved, and with it the conception of specialized types of aircraft, each with a specific function to fulfil. Until the end of 1916, bombing was done by aeroplanes which were in reality general-purpose types—converted fighters such as the Martinsyde Elephant, Sopwith 1½-Strutter, and F.E.2b, or corps reconnaissance machines like the B.E.2c and 2d—all of which were quite capable of carrying the small bombs of the period.

When it was realized that an aeroplane of a special type was required for day-bombing purposes, the task of designing such a machine was entrusted to the Aircraft Manufacturing Company, the ultimate responsibility for the design falling upon Geoffrey de Havilland. The aeroplane, designated the D.H.4, was actually designed around the then-new 200 h.p. six-in-line B.H.P. engine, and the prototype first appeared in August, 1916.

By a happy coincidence, at the time of the D.H.4's appearance, the great Rolls-Royce concern was developing the liquid-cooled 12-cylinder vee engine which was later known as the Eagle and which, in its Mk VIII form, delivered no less than 375 h.p. Prototype tests of the D.H.4 with both the B.H.P. and Rolls-Royce were highly successful and production was initiated with such efficiency that No. 55 Squadron, R.F.C., was able to go to France fully equipped with Eagle-powered D.H.4s on March 6th, 1917. Various marks of Eagle were fitted to the D.H.4 in service, and could be distinguished from the similarly cowled Rolls-Royce Falcon (also fitted to the D.H.4) by the left-hand airscrew. The Falcon, of course, drove a right-hand airscrew.

D.H.4 day bombers (B.H.P. engine) of No. 27 Squadron at Serny aerodrome, Pas de Calais, France, on February 17th, 1918.

The prototype D.H.4 which had the B.H.P. power-unit differed from standard in having the rear centre-section struts meeting the upper longerons at a point farther aft than on production machines, with the result that these struts sloped forward in side elevation. A four-blade right-hand airscrew was fitted, but most production D.H.4s with the B.H.P. engine had two-blade airscrews. The exhaust-pipe of the prototype led upwards to a point above the leading edge of the centre-section on the port side, a feature repeated on some of the production B.H.P.-powered machines, though others had a simple horizontal pipe on the port side only.

Several other types of engine were fitted to the D.H.4, and performance varied with the power of the engine installed. The D.H.4s which had the R.A.F. 3A* power unit could be distinguished by the single central exhaust stack, four-blade left-hand airscrew, and radiator wider at the top than at the bottom. The Fiat installation bore a resemblance to the later D.H.9's nose configuration, but the lines of the cowling around the lower part of the Fiat were more bulbous than those of the cowling of the D.H.9's B.H.P. The Fiat's exhausts were on the starboard side and consisted of two short manifolds, each of which carried away gases from three cylinders.

Structually, the D.H.4 was typical of the 1914-1918 period. The fuselage was the usual box girder, but in it a slight departure was made from the convention of the time, for the front portion was covered with plywood as far aft as the gunner's cockpit, and there was no internal wire bracing. The rear section of the fuselage was constructed as a separate unit and was attached to the forward portion by means of fishplates. Normal wire cross-bracing was used in the rear portion and fabric covering was applied. There were four wire-braced bays in the rear fuselage, the fifth and rearmost being sub-divided by two vertical spacers and covered with plywood. The longerons were of spruce, and ash engine-bearers were fitted.

The wings and tail unit were conventional in construction, and were braced with "Raf-wires." The mainplanes had two spars of spruce, spindled out between the compression ribs. The ailerons were attached to the rear spars, and their balance-cables ran externally along the leading edges of the wings. The incidence of the tailplane was controllable and could be varied from +2 deg to +5 deg. The undercarriage was a simple, sturdy vee structure, with rubber cord shock-absorbers at the apices of the vees. Later in its career the D.H.4 was provided with a taller undercarriage.

* *These initials stood for Royal Aircraft Factory, the former name of the Royal Aircraft Establishment, Farnborough.*

Hunting Aerosurveys Limited, using a Percival Prince powered by two Alvis Leonides engines, recently carried out an aero survey of Ceylon.

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side-by-side Basic Trainer,

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128.251

An R.A.F. 3A-engined machine of No. 18 Squadron. Note bombs under the wings and the pilot's Vickers gun mounted to port on the cowling.

The de Havilland D.H.4 . . .

Early versions of the D.H.4 had the observer's gun-ring mounted directly on top of the upper longerons, with a rounded top-decking behind and in front of the observer's cockpit. These fairings must have hampered the movement of the Scarff mounting to some extent, and all the later production machines had the gun-ring mounted above the upper longerons at a level from which a flat top-decking sloped down to the tail, giving the observer a clear field of fire. A feature which appeared on the B.H.P.-powered prototype and some production D.H.4s was a large transparent clear-view panel in the centre-section.

Ample testimony to the excellent handling qualities of the type is afforded by the following official report on the D.H.4 after flying tests of the prototype had been carried out at the Central Flying School: "*Stability*.—Lateral very good; longitudinal very good; directional very good. *Control*.—Stick. Dual for elevator and rudder. Machine is exceptionally comfortable to fly and very easy to land. Exceptionally light on controls. Tail-adjusting gear enables pilot to fly or glide at any desired speed without effort."

Performance, too, was excellent, particularly with the Rolls-Royce Eagle, and was at least equal to that of most contemporary fighting scouts. Certainly the Eagle D.H.4 was without peer among the day-bombing aeroplanes used by the aerial forces of any of the combatant nations. Its high ceiling and speed occasionally enabled it to escape the attentions of enemy scouts but, when forced to fight, it was curiously vulnerable owing to the excessive distance which separated the pilot's and observer's cockpits. The main fuel tanks occupied the intervening space and a speaking-tube was fitted to enable the crew to communicate; but obviously this could be of little use in the heat of combat. Thus it was not always possible for the pilot to co-operate to the full with his observer and, as a result, the fighting efficiency of the machine was considerably diminished. Full dual control was provided in the observer's cockpit. The rear control column was detachable, and the air-speed indicator and altimeter were duplicated.

Comfortable and tractable as it was, the D.H.4 had two grim nicknames—"The Flaming Coffin" and "The Flaming Four." These soubriquets were bestowed on it because it had a reputation for catching fire very easily in the air.

No. 55 Squadron was the first R.F.C. unit to have the D.H.4 as its equipment and went to France to join the 9th Wing on March 6th, 1917. From then until the Armistice the machine gave excellent service with the R.F.C., R.N.A.S. and R.A.F. as a day bomber, anti-Zeppelin fighter and anti-submarine patrol aeroplane. The D.H.4 received its baptism of war in the hands of No. 55 Sqn. during the Battle of Arras, No. 55's first action being the bombing of Valenciennes railway station and an ammunition dump on April 23rd, 1917. May 3rd of that year saw No. 55 making heavy attacks on Busigny and Brebieres junctions.

During the great German offensive of March, 1918, the D.H.4s of Nos. 25, 27 and 5 Naval Sqns. played a leading part in the tactics of harassing the enemy by low-level bombing attacks, though their efforts were impeded by unfavourable weather. The last-named unit, as No. 205 Sqn., R.A.F., distinguished itself in August, 1918, during the great British offensive at Amiens when, during four days, it flew for 324 hr 13 min and dropped 16 tons of bombs—a remarkable record for single-engined bombers of that period.

No. 55 Sqn. was one of the first units to form part of the Independent Air Force, and was very much to the fore in 1918 when, in common with the other bombing squadrons of the I.A.F., it made life miserable for German munition workers who had believed themselves to be comparatively safe in such towns as Freiburg, Saarbrücken, Mannheim and Metz. On May 18th, 1918, six of No. 55's D.H.4s bombed Cologne from 14,000ft and created a minor panic, for the town had been attacked only twice since the beginning of the war.

The R.N.A.S. began to use D.H.4s in 1917 for bombing, photographic reconnaissance, anti-submarine and anti-Zeppelin patrols. Before the attempt to block the entrances to Zeebrugge and

WEIGHTS AND PERFORMANCE

	200 h.p. R.A.F. 3A	230 h.p. B.H.P.			250 h.p. R.R. Falcon	375 h.p. R.R. Eagle	260 h.p. Fiat A.V.5000		American D.H.4 400 h.p. Liberty
		No bomb load	With 2 x 112 lb bombs	With 4 x 112 lb bombs			No bomb load	With 2 x 230 lb bombs	
Weight empty	2,304 lb	2,197 lb	2,197 lb	2,197 lb	2,239 lb	2,387 lb	2,306 lb	2,306 lb	2,391 lb
Weight loaded	3,340 lb	3,234 lb		3,610 lb	3,313 lb	3,472 lb	3,360 lb	3,822 lb	4,297 lb
Max. speed at s.l.	122 m.p.h.					143 m.p.h.			124.7 m.p.h.
do. at 10,000ft	117.5 m.p.h.	114 m.p.h.	109.5 m.p.h.	106 m.p.h.	113 m.p.h.	133.5 m.p.h.	111 m.p.h.	106.5 m.p.h.	117 m.p.h.
do. at 15,000ft	110.5 m.p.h.	106.5 m.p.h.			102.5 m.p.h.	126 m.p.h.	103 m.p.h.		113 m.p.h.
Landing speed		52 m.p.h.				52 m.p.h.			58 m.p.h.
Climb to 1,000ft	1 min 25 sec	1 min 25 sec			1 min 05 sec	0 min 45 sec	1 min	1 min 40 sec	
do. 10,000ft	14 min 15 sec	19 min 10 sec	19 min 12 sec	24 min 36 sec	16 min 25 sec	9 min	15 min 35 sec	26 min 40 sec	14 min
do. 15,000ft	29 min 18 sec	37 min 55 sec			36 min 42 sec	16 min 30 sec			
Absolute ceiling	19,500ft	20,000ft			18,000ft	23,500ft	19,000ft	14,500ft	19,500ft
Normal endurance	4 hr	4½ hr				3½ hr	4½ hr		3 hr

THE DE HAVILLAND D.H.4

Alternative power plants: 200 h.p. R.A.F.3A; 230 h.p. B.H.P.; 250 h.p. Rolls-Royce Falcon; 375 h.p. Rolls-Royce Eagle VIII (and earlier marks); 260 h.p. Fiat A.V.5000.

Dimensions (Eagle VIII version):

Span	42ft 4½in
Length	30ft
Height	11ft
Wing area	434 sq. ft.

Manufacturers: The Aircraft Manufacturing Co., Ltd., Hendon, London, N.W.

Sub-Contractors: Westland Aircraft, Ltd., Yeovil, Somerset.

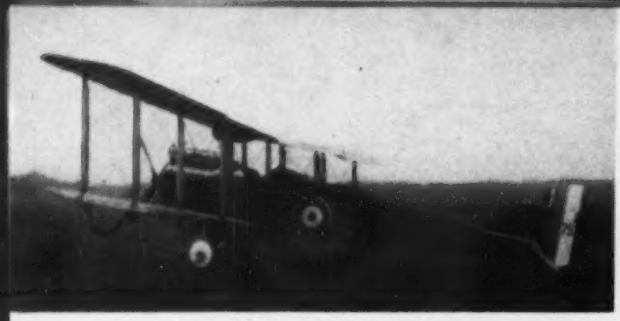
Production and Allocation: 1,449 D.H.4s were built before the end of 1918, and 1,170 were in service with the R.A.F. and Independent Air Force late in that year; 664 were with R.A.F. squadrons in France; 91 were with the Independent Air Force; 67 were with the Dover-Dunkirk Command (5th Group); 18 were in the Middle East.

Armament: One fixed 0.303in Vickers gun on top of the fuselage to port of centre, synchronized by Constantinesco gear to fire through the airscrew. The observer's armament usually consisted of one or two double-yoked 0.303in Lewis guns on a Scarff ring, but an alternative installation consisted of two Lewis guns on individual pillar mountings. A few Westland-built D.H.4s (e.g., N.5960) had two fixed forward-firing Vickers guns. Bomb carriers were fitted under each lower mainplane and fuselage. For anti-submarine work the D.H.4 could carry depth charges instead of bombs.

Used by Squadrons: Western Front: Nos. 18, 25, 27, 49, 55 and 57, R.F.C. R.A.F.3A-powered D.H.4 used by Nos. 18 and 49; 250 h.p. Rolls-Royce-powered D.H.4 used by Nos. 25, 55 and 57, R.F.C., and by No. 5, R.N.A.S. (later No. 205, R.A.F.); B.H.P.-powered version used by No. 27, R.F.C. Mesopotamia: "A" Flight of No. 72, R.F.C., attached to 1st Army Corps. Aegean Group: D.H.4s attached to 62nd and 63rd Wings (Nos. 220, 221 and 222). Italy: D.H.4s attached to 66th and 67th Wings, Taranto (Nos. 223, 224, 225, 226 and 227). Coastal Patrol: Nos. 2, 5 and 17, R.N.A.S. (later Nos. 202, 205 and 207, R.A.F.). No. 273, R.A.F. (part equipment, together with D.H.9s, of two flights only, situated at Covehithe and Westgate). Russia: R.A.F. contingent at Archangel (May, 1918) had eight R.A.F.3A-powered D.H.4s. Later, the Fiat-powered version was used in North Russia. Trainer version at: Hythe, Manston, New Romney and Eastchurch (Air Observers' School); Farnborough (School of Photography, Maps and Reconnaissance); Andover, Stonehenge and Thetford (School of Navigation and Bomb-dropping). Greece: Used by the Royal Hellenic Naval Air Service.

Serial Numbers: A.2125-A.2174, A.7401-A.8089, B.1482, C.4501-C.4550, D.8351-D.8430 built by the Aircraft Manufacturing Co.; B.9476-B.9500, D.1751-D.1775 built by Westland Aircraft, Ltd.

Notes on Individual Machines: A.1376, aircraft "G," No. 55 Sqn.; A.2129, tested with 250 h.p. Rolls-Royce Falcon, engine No. W.D. 10071; A.2134, No. 51 Sqn.; A.2138, No. 51 Sqn.; A.2159, No. 25 Sqn.; A.2168, tested with 200 h.p. R.A.F.3A, engine No. W.D.6583; A.2176, aircraft "L," No. 25 Sqn.; A.7442, aircraft "B," No. 25 Sqn.; A.7446, tested with 360 h.p. Rolls-Royce Eagle; A.7470, No. 25 Sqn.; A.7487, No. 25 Sqn.; A.7505, No. 25 Sqn.; A.7527, No. 25 Sqn.; A.7532, tested with 260 h.p. Fiat A.V.5000 engine No. Fiat A/12841; A.7535, aircraft "H," No. 25 Sqn.; A.7550, No. 18 Sqn.; A.7557, aircraft "2," No. 18 Sqn.; A.7562, No. 25 Sqn.; A.7583, aircraft "2," No. 57 Sqn.; A.7602, No. 25 Sqn.; A.7609, No. 25 Sqn.; A.7626, aircraft "N," No. 25 Sqn.; A.7652, No. 25 Sqn.; A.7664, No. 25 Sqn.; A.7823, No. 25 Sqn.; A.7842, No. 27 Sqn.; A.7875, No. 55 Sqn.; B.3960, aircraft "6," No. 51 Sqn.; B.9458, tested with 230 h.p. B.H.P., engine No. S.D.5028, W.D.22702; D.8372, No. 25 Sqn.; F.2694, became G-EAHG; F.2699, became G-EAHP; F.2702, became G-EAJC; F.2704, became G-EAJD; F.5764, became a D.H.4A of No. 24 Sqn.; N.5960, Westland-built, 230 h.p. Rolls-Royce, twin Vickers guns.



The prototype installation of the Fiat A.V.5000 engine was made in this D.H.4 (serial A.7532). A speed of 111 m.p.h. was attained at 10,000ft.

The de Havilland D.H.4 . . .

Ostend, the D.H.4s of No. 202 Sqn. took dozens of photographs of the German defensive systems, and a D.H.4 flown by W/C. Fellowes made a daring bombing attack on the Zeebrugge Mole.

On August 12th 1918, four D.H.4s of No. 217 Sqn. attacked the submarine U.B.12, and Capt. K. G. Boyd scored direct hits with his two 230 lb bombs. The other three D.H.4s attacked, and the U-boat turned turtle and sank.

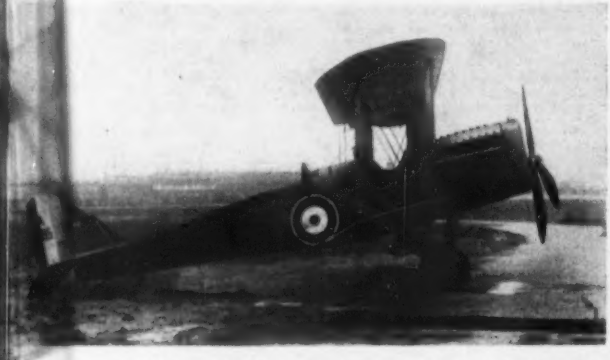
Great Yarmouth Naval Air Station first took delivery of D.H.4s for anti-Zeppelin patrols on August 26th, 1917. Almost a year later, on August 5th, 1918, a D.H.4 from that station shot down the new Zeppelin L.70 and damaged the L.65 to such an extent that it had to abandon its raid. The aircraft was flown by Maj. Egbert Cadbury with Capt. Robert Leckie as his observer, and they made their kill at 10.20 p.m., flying at 16,400ft. Leckie's explosive bullets struck the Zeppelin three-quarters of the way aft and the whole airship was soon a blazing mass. In her perished Fregatten Kapitän Peter Strasser, Commander-in-Chief of the Imperial German Airship Service; his loss was a severe blow to the enemy.

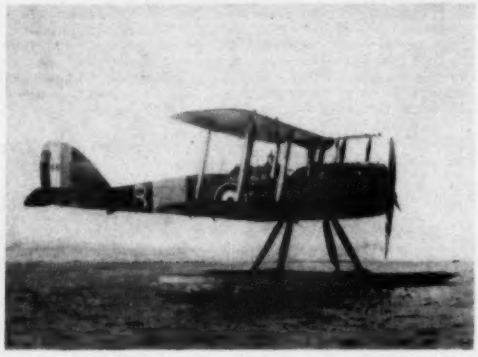
On anti-Zeppelin work a scheme was tried in which a flying-boat and a D.H.4 collaborated. The idea was for the D.H.4 to fly high and the flying-boat to stay at a low altitude. It was assumed that, on spotting the flying-boat, a Zeppelin would climb, to be intercepted by the D.H.4. The L.44 was actually caught in this manner by a Curtiss H.12 "Large America" and a D.H.4, but the D.H.4 developed engine trouble and the Zeppelin escaped. On the way home the D.H.4 had to ditch 50 miles from the English coast, whereupon the H.12 landed alongside and picked up the D.H.4's crew, but was then unable to take off with the extra load. The boat was taxied until its fuel gave out, a feat which speaks volumes for the skill of its pilot. Carrier pigeons were then released at intervals, and finally, after two days, the airmen were rescued by H.M.S. *Halcyon*. This must have been one of the earliest attempts at air-sea rescue.

It may have been that with eventualities such as this in mind the D.H.4 was selected as one of the machines on which experiments with flotation gear were carried out at the Marine Experimental Aircraft Depot, Isle of Grain. The undercarriage was modified to include a biplane hydrovane forward of the main vees, and a compressed-air device was used to blow the wheels off before alighting on the water. The flotation gear proper consisted of two inflatable air bags, attached outside the fuselage to the lower longerons, and small wing-tip floats were also fitted. The D.H.4 which was the subject of this experiment had a R.A.F. 3A engine.

Another experiment designed to counter Zeppelin attacks was made with two D.H.4s, in each of which a Coventry Ordnance Works 1½-pounder gun was mounted to point upwards at an acute angle, the breech being close to the floor of the rear cockpit and the muzzle protruding through the upper centre-section. The barrel was just behind the pilot's head. The pilot was expected to aim the gun by means of an improvised sight—composed of two beads—which was to be lined up with the target by judicious use of the elevator, whereupon the signal to fire was given to the gunner.

Considerable structural alterations had to be made to these two D.H.4s in order to provide the requisite strength where it was required in the fuselage, and the centre-section had to be covered with metal to withstand the blast from the gun. As a result of this remarkable installation the two D.H.4s were somewhat overloaded and decidedly unpleasant to fly, but by the time they were ready the Zeppelin menace had been effectively overcome. They were sent to France for a night test over the enemy lines, but the Armistice was signed a few days after their arrival and the C.O.W.-gun D.H.4s never saw action.



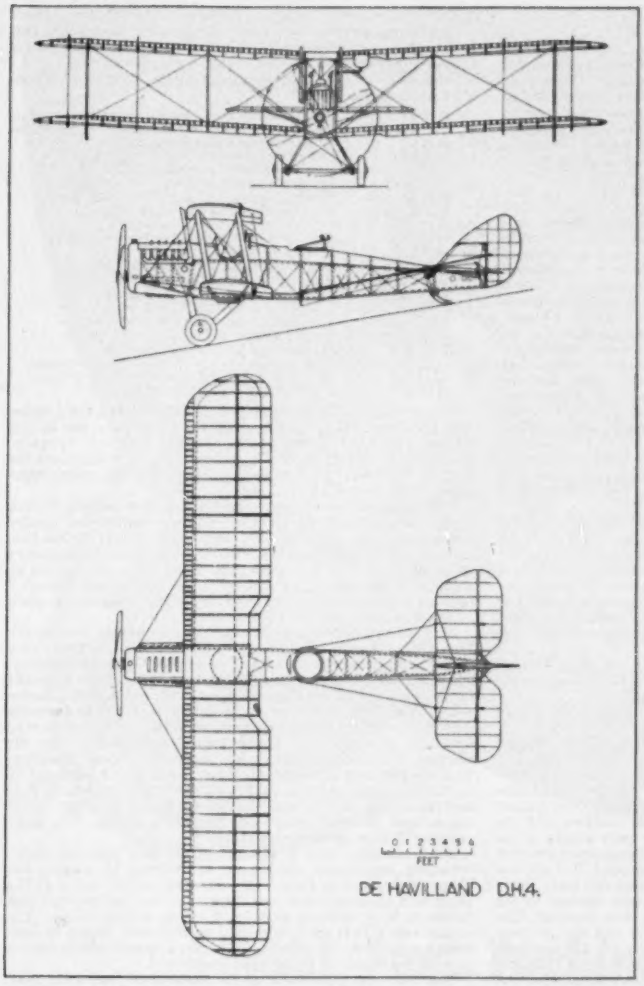


Above is a late Eagle-engined machine with the taller undercarriage. Right is the experimental twin-float seaplane, and below is a D.H.4A as used by the R.A.F. Communications Wing.

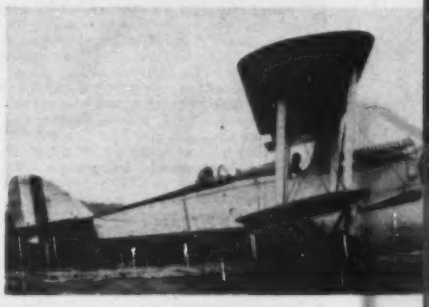
In Macedonia, the R.N.A.S. D.H.4s based on the Aegean islands of Lemnos, Mitylene, Imbros and Thasos made numerous attacks on the main Sofia-Constantinople railway. They also bombed the German cruiser *Goeben* in the Aegean Sea in January 1918, when, after coming out of the Dardanelles, accompanied by the *Breslau* and a Turkish destroyer, and sinking H.M.S. *Raglan* and another monitor, the *Goeben* ran ashore in the Narrows. Bombing attacks were made by day and night and the enemy vessel finally returned to Sternia Bay, where she remained until the end of the war.

An R.A.F. contingent was ordered to Northern Russia in May 1918 to operate with a special force which was being sent to Archangel. It consisted of eight D.H.4s with R.A.F. 3A engines and a complement of personnel and stores. Later in the Russian campaign Fiat-powered D.H.4s were also used.

Post-war and Civilian Service.—After the Armistice the Service life of the D.H.4 was brief. Its immediate post-war duty was of a quasi-commercial nature, for 18 D.H.4 and D.H.4A aeroplanes were used by the Communications Wing on its



D.H.4 experimentally fitted with Grain flotation gear, wing-tip floats and hydrovanes.



Above, American-built D.H.4 (Liberty), Ford Junction, Sussex, October, 1918. Below, London-Paris D.H.4A. Pilot, F. L. Barnard.

London-Paris service during the 1919 Peace Conference, average time for the journey being 2 hr 10 min. The D.H.4 vanished from squadron service very rapidly, however, and the unwanted surplus machines were disposed of in accordance with the custom of the time—by sale to foreign countries or to civilian owners.

Greece used the D.H.4 as part of the equipment of the Royal Hellenic Naval Air Service, and Spain ordered D.H.4s, Bristol Fighters and D.H.9As in 1921 for the expansion of her air force after the Riff rising, led by Abd-el-Krim, in Spanish Morocco. These D.H.4s were flown to Spain by freelance pilots. One of the most unusual purchases of a D.H.4 was that made by the Imperial University of Tokio (presumably for purposes of practical demonstration), consequent upon the establishment there of a chair of aviation.

The D.H.4 made its mark in civilian aviation by being the first aeroplane purchased for commercial use by a concern not connected with aircraft manufacture. The firm was S. Instone and Co., Ltd., the date September 1919, and from that small beginning grew the successful Instone Air Line.

The Aircraft Manufacturing Co. were not slow to recognize the commercial possibilities of the type, and in 1919 produced the D.H.4A, a modification of the D.H.4 which provided enclosed accommodation for two passengers. The D.H.4A was probably the true pioneer British commercial aeroplane, for it was in use, by the Aircraft Manufacturing Company's subsidiary firm, Air Transport and Travel, Ltd., as early as August 25th, 1919. It was also used by the R.A.F.'s Communications Wing, as related above, and by Instone Air Lines. Instone's D.H.4A, G-EAMU (375 h.p. Rolls-Royce Eagle), made history by winning the first King's Cup Race in 1922. It was flown by the late F. L. Barnard and its average speed was 123.5 m.p.h.

A D.H.4 airframe was specially modified for air racing by drastically clipping the lower mainplane and fitting a 450 h.p. Napier Lion engine. Long struts were provided to support the extensions of the upper mainplanes, and the net result was an extremely ugly aeroplane. This racing version was designated D.H.4R and bore the civil registration K.141, later G-EAEW. Despite its decidedly unappealing appearance it was fast, and, flown by Capt. Gathergood, it won the 1919 Aerial Derby at a speed of 129.5 m.p.h. Wing area of the D.H.4R was 323 sq ft, and the manufacturer's performance figures quote maximum speeds of 150 m.p.h. at low altitude and 146 m.p.h. at 10,000ft.

Not only did the D.H.4 pioneer airline flying at home, but it helped to blaze air trails in distant parts. In 1923, a three-seat D.H.4 joined the two Armstrong Whitworth F.K.8s which were then the total airline fleet of Queensland and Northern Territory Air Service (Qantas). The original "airline" was *via* Charleville-Longreach-Cloncurry.

In New Guinea, the Bulolo Goldfields Aeroplane Service was formed in 1927 with a solitary D.H.4 as its equipment. The motivating genius behind this enterprise was Ray Parer, but he had the misfortune to wreck the company's sole airworthy asset on

The de Havilland D.H.4 . . .

the first trial flight made by the D.H.4 after its arrival and assembly in New Guinea. The crash was caused by engine trouble, and occurred at Rabaul. Parer was able to rebuild the aircraft, and he flew it across the sea to Lae, where stores and miners were waiting to be flown to the goldfields. The Bulolo Goldfields Aeroplane Service soon began to show a handsome profit, and the D.H.4 was later supplemented by a D.H.9 and a Bristol Fighter.

The D.H.4 in America.—After the entry of the United States of America into the Great War in April 1917 only a comparatively short time elapsed before the great manufacturing resources of that country were utilized to produce aircraft on a scale which, at that time, was enormous. The production drive did not really get under way until 1918, but some idea of its ambitious scale may be gained from the fact that orders for 61,000 aircraft were cancelled because of the signing of the Armistice. Several British designs were among those selected for mass production in America. These were the D.H.4, D.H.9. D.H.9A (U.S.D.9A), Bristol Fighter F.2B, Handley Page O/400, Martinsyde F.4 and S.E.5A, but of these the D.H.4 was and remains the best-known example of a British aeroplane built in America during the 1914-18 war, principally because it was built in larger numbers than any of the other types. It was one of the first British types to be chosen by the Bolling Commission for large-scale production in America, mainly because it was a tried design which was capable of taking the mass-produced Liberty engine. As early as May 25th, 1917, the Joint Army and Navy Technical Aircraft Board presented to the Secretaries of the War and Navy Departments a procurement programme of 7,375 aeroplanes for the U.S. Army, which total included 1,700 D.H.4s.

A sample British-built D.H.4 without engine arrived at Dayton, Ohio, on August 15th, 1917, and made its first flight with the 400 h.p. Liberty 12 engine on October 29th, 1917. Contracts were placed with several manufacturing firms and before the end of the war 4,844 D.H.4s were built by the Dayton-Wright, Fisher Body and Standard concerns. With the signing of the Armistice seven contracts, totalling 7,502 D.H.4s, were cancelled. Up to the time of the Armistice 1,440 American-built D.H.4s were delivered to the American Expeditionary Force.

Brief details of the American-built D.H.4 are as follows:—

Dayton-Wright D.H.4 (400 h.p. Liberty 12). First delivery February 1918; 3,104 built and 1,900 cancelled.

Fisher Body D.H.4 (400 h.p. Liberty 12). First delivery July 1918; 1,600 built and 2,400 cancelled.

Standard D.H.4 (400 h.p. Liberty 12). First delivery August 1918; 140 built and used as trainers in the U.S.A.; 860 cancelled.

Two D.H.4 modifications were made by the Engineering Division of the Bureau of Aircraft Production. The first was introduced in July 1918, by fitting a revised fuel system. This aircraft was re-designated D.H.4A and should not be confused with the British post-war commercial D.H.4A. The gross weight of the American D.H.4A was 4,300 lb. The second Engineering Division modification, made in October 1918, and designated D.H.4B, was the D.H.4A with the positions of the pilot and fuel tanks interchanged, an eminently sensible alteration which resulted in the pilot's and observer's cockpits being brought close together. The D.H.4B was powered by the 400 h.p. Liberty 12A and its gross weight was 4,595 lb. During the years 1919-23, ten different contractors undertook the conversion of 1,534 D.H.4s to D.H.4Bs, and others were similarly modified by air depots, first delivery of the modified machines being made in February 1919.

So many D.H.4s and spares were made in America that it is not surprising to find that the type survived there for many years after the war. The modifications made to the basic design were numerous—indeed, more than 60 different designations were applied to D.H.4 variants—and several post-war American designs embodied D.H.4 components. In 1923 the Boeing Airplane Co. built 53 D.H.4Ms, which were revised D.H.4s and D.H.4Bs with steel-tube fuselages and the 420 h.p. Liberty 12A engine, the gross weight being 4,510 lb. The Boeing concern followed these with 97 D.H.4M-1s in 1923 and 1924, the later model incorporating old and new components but being substantially similar to the D.H.4M. In 1924 the Atlantic Aircraft Co. produced 135 D.H.4M-2s, another version with a fuselage of steel-tube construction.

Some other examples of the designations given to American D.H.4s are as follows:—

D.H.4 Amb-1	Ambulance with accommodation for one stretcher.
D.H.4 Amb-2	Ambulance with accommodation for two stretchers.
D.H.4B	88-gallon main fuel tank fitted.
D.H.4B-1	110-gallon main fuel tank.
D.H.4B-2	76-gallon leak-proof main fuel tank.
D.H.4B-3	135-gallon main fuel tank.
D.H.4B-4	Airways version, 110-gallon main fuel tank.
XD.H.4B-5	Engineering Division Airways version.
D.H.4BD	D.H.4B adapted for crop-dusting.
D.H.4BG	D.H.4B with smoke-screen apparatus fitted.
D.H.4BK	D.H.4B equipped for night-flying.
D.H.4BM	Single-seat transport communications type.
D.H.4BM-1	Transport version, dual controls.
XD.H.4BP	Experimental photographic aircraft.
D.H.4BP-1	Photographic aircraft.
XD.H.4BS	D.H.4B with supercharged Liberty engine.
D.H.4BT	Trainer version of D.H.4B; dual controls.
D.H.4BW	D.H.4B with 300 h.p. Wright H engine.
D.H.4C	D.H.4B with 350 h.p. Packard 1A-1237 engine.
XD.H.4L	185-gallon main fuel tank. Endurance 9 hours.
D.H.4M	Fuselage of steel-tube construction.

Among the post-war designs which embodied D.H.4 components were the Orenco IL-1 (400 h.p. Liberty 12) of 1922, the Boeing XCO-7 (435 h.p. Liberty 12A), Boeing XCO-7A (435 h.p. Liberty 12A), Boeing XCO-7B (420 h.p. Liberty V-1410) and the Atlantic XCO-8 (435 h.p. Liberty 12A), the four last-named types being products of 1924.

The Dayton-Wright Co. produced a passenger-carrying version of the D.H.4 for civilian use in 1919. A transparent canopy covered the rear cockpit in which were installed seats for two passengers, and at 3,410 lb all-up weight the machine had a maximum speed of 115 m.p.h. low down, and could climb to 10,000ft in 10 min. A later model was known as the "Nine-hour Cruiser," having a maximum endurance of nine hours and a maximum speed of 122 m.p.h. at 4,193 lb all-up weight.

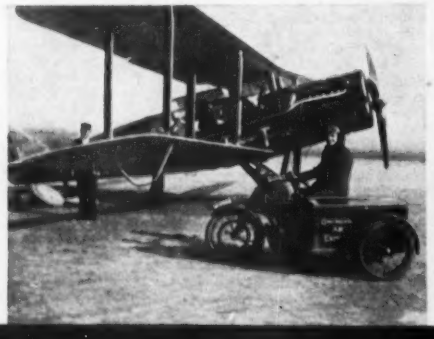
Many of the surplus American D.H.4s were taken over by the Post Office Department for use as air-mail carriers from 1919 onwards. It cost about $2,000 to rebuild each D.H.4 for this duty, and some 600 structural changes were made in the design, the most noticeable of which was the conversion of the machine to a single-seater. The D.H.4s used on the air-mail routes were not popular with their pilots, but the type continued to be used by commercial operators after the Post Office Department handed over the carrying of air-mail to contractors. Robertson Aircraft Corporation, operators of Contract Air Mail Route No. 2 (Chicago to St. Louis), began operations on April 15th, 1926, with 14 D.H.4s and two Curtiss Orioles, and National Air Transport's fleet, which began work on May 12th, 1926, included a D.H.4. The mail-carrying D.H.4s survived until 1927.

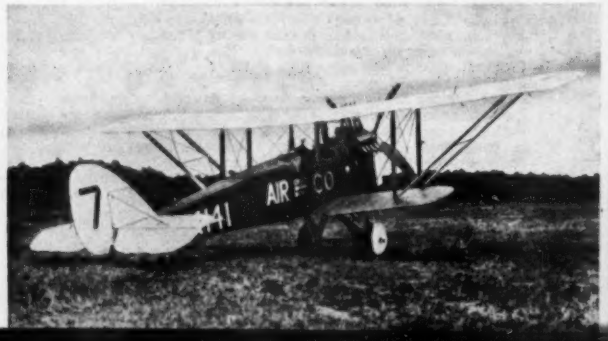
American-built D.H.4s figured in the first practical flight-refuelling experiments carried out at Rockwell air station, San Diego, California, in 1923. The receiving aircraft was a D.H.4 fitted with an extra petrol tank behind the rear cockpit, this tank having a large opening capable of taking a hose-nozzle. The tanker was a D.H.4B-1, equipped with a 50-ft length of hose having a quick-acting shut-off valve, and a special tank system to provide the supply of petrol to be transferred.

The first tests were made on the morning of June 27th, 1923, when the D.H.4 was flown by Lieuts. Lowell Smith and Paul Richter, and the D.H.4B-1 by Lieuts. Virgil Hine and F. W. Seifert. Two contacts were made, 25 gallons being passed at the first and 50 at the second. The D.H.4 remained airborne for 6 hr 38 min.

This demonstration was not regarded as conclusive, but the next attempt was highly successful. It began at 4.44 a.m. on August 27th, 1923, and the D.H.4 remained in the air for 37 hr 15 min, during which time it received from the tanker 309 gallons of petrol and 15 gallons of oil.

(Left) Express freight delivered to an Instone D.H.4A at Hounslow in 1920. (Right) The D.H.4R which won the 1919 Aerial Derby at 129.5 m.p.h.





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CIVIL AVIATION

AIR/SEA TROOPER: Reported to be the first flying-boat in ten years to have visited Limassol, S.W. Cyprus, this Aquila Airways Solent was photographed there during a recent trooping flight from Southampton to Singapore.

TUNNEL FOR GATWICK?

THE suggestion that construction of a tunnel under the proposed new runways at Gatwick Airport might be preferable to diverting the main London-Brighton road was made in a letter to *The Times* last week by Mr. A. J. Quin-Harkin, manager of the I.A.T.A. Clearing House in London. Pointing out that the length of new road construction would be between three or four times that of the road section to be closed, Mr. Quin-Harkin asked whether the planners and civil engineers had considered the idea of a tunnel, which would avoid capital expenditure on land purchase, save costs to road users and spare charming country from spoliation.

As shown by the map on page 503 of this issue, the proposed runways are 200ft wide and 3,200ft apart, running parallel from east to west. While the cost of a tunnel running from north to south under the entire airfield might well be prohibitive, there seems no reason why the main road should not be built between the runways, not only to replace the present London-Brighton road, but to give direct access to the new airport terminal (and, possibly, to a well placed public enclosure). As the runways have not yet been built, the two necessary tunnels could be incorporated at minimum cost.

REPORT ON B.O.A.C. HERMES ACCIDENT

PUBLISHED last Tuesday, the official French report on the accident to the B.O.A.C. Hermes G-ALDN (which made a forced landing in French West Africa on May 26th) states that the aircraft's captain, first officer, navigator and radio officer "in varying degrees . . . did not display the full measure of competency required for the accomplishment of their mission." Defective telecommunications, the report adds, "constituted a circumstance promoting the occurrence of the accident."

It appears that after taking-off from Tripoli for Kano, the navigator set the variation control on the CL2 gyrosyn master unit at 30 deg W. instead of 3 deg, and that he increased the setting progressively to 60 deg W. during the flight. When the error was discovered by the engineer officer, nearly six hours after take-off, the aircraft was probably about 900 miles N.W. of Kano instead of close to its destination, as the crew had imagined. The investigators found that no decisive action had been taken by the captain for more than 1 hr 15 min after the error had been discovered.

It is hoped to publish the findings and recommendations of the enquiry in greater detail in a later issue. Shortly before the report was published a statement had been issued by the British Air Line Pilots' Association in which criticism was made of the action taken by the M.C.A., last July, in suspending the licences of the captain and navigator of the Hermes.

MORE ABOUT THE COMET III

ACCORDING to *Aviation Week*, the proposed power units for the Series III Comet will be Rolls-Royce Avon Ra 16 turbojets, each delivering 9,000 lb s.t.; this engine, our contemporary adds, is the "civil version of the military Ra 14, which is rated at 10,000 lb, and powers the new Avro 698 delta-wing bomber and the Vickers Valiant bomber."

As readers know, mark numbers and power-ratings of later types of Avon have not been revealed in this country, and the latest official statement on the Comet III (see page 502) refers simply to "civil versions of the Avon giving 9,000 lb thrust." The American journal says that the fuselage of the Series III Comet will be 110ft long—17ft longer than the Series I's—and that the Series II wing-span and area will be retained on the later aircraft. However, "double slotted flaps will be incorporated into the new model to improve lift qualities at low speeds on take-off and landings." Other improvements, it is stated, will include a 15 deg outward deflection of both jet pipes of the inboard Avons to reduce cabin noise-level, and the fitting of two permanent external fuel tanks in the "wing leading edge about half-way between each wing tip and outboard engine."

The Series III Comet is at the moment in an advanced stage of design, and de Havillands are reluctant to issue detailed facts and figures before the actual aircraft has materialized. There is, however, no means of preventing leakage of their preliminary estimates *via* the potential buyers to whom they must be given. It is this fact, normally, which underlies this constant flow of unofficial advance information on the performance of later Comets.

RESULTS OF THE ROME CONVENTION

THE results have been announced of the recent Diplomatic Conference on International Air Law, which was convened in Rome by I.C.A.O. to define the liability of airlines of one nation to third parties on the ground of another.

The convention established certain relationships between the weight of aircraft and the limits of liability to which they are subject. Aircraft are thus divided into five groups: weighing 2,204 lb or less, 2,204-13,228 lb; 13,228-44,092 lb; 44,092-110,232 lb; and more than 110,232 lb. The limits of liability established vary between £13,161 for relatively light aircraft in the first group and £276,381 for aircraft weighing more than 110,232 lb. It was resolved that the liability in respect of loss of life or personal injury should not exceed £13,161 per person killed or injured.

CHARTER NOTES

ALTHOUGH few of the British independent operators could claim to be really busy on charter flights during the week ended October 12th, operations were not nearly so slack as in the previous seven days. Of great significance, however, was the announcement by Scottish Airlines that they have won a new trooping contract for the carriage of air cadets between this country and Montreal. To enable them to undertake this work the company has bought three Avro Yorks from the Air Ministry; Scottish will fit them out for trooping with 37 rearward-facing seats and begin operations across the North Atlantic on November 15th.

During the last week, about 98 *en route* charter flights were completed, 89 of them on the Berlin-Hamburg and Berlin-Hanover freight and refugee ferries. Altogether, the flying amounted to about 66,500 miles, 40 per cent of them in Germany. Of the total, freight flying accounted for 41,000 miles and passenger work for 25,000 miles. The freight uplifted totalled about 405 tons and the passengers carried, just over 1,500—almost all of them in Germany. Freight ton-miles amounted to about 114,000 and passenger-miles to 680,000 (about 60,000 ton-miles). Yorks again flew the greatest distance of the week, covering 31,000 miles; a Viking flew 13,000 miles; Bristol 170s, 12,000 miles; and Dakotas, 10,000 miles. Flying hours totalled 380 and approximate revenue was £33,000.

A QANTAS SURVEY

VISITING this country recently was Mr. W. Hudson Fysh, chairman of Qantas Empire Airways, and it is probable that his presence here was not entirely unconnected with the subject of the Commonwealth discussions reported on page 495. In addition, however, he has been making a personal examination of some of the new British turbine transports, for his company must very shortly place orders for the new equipment which it will need not later than four years from now.

Mr. Fysh told us that Qantas will always operate British aircraft when it is commercially possible, and he indicated that while he had the highest opinion of the Constellations (particularly the 1049Cs, of which the company now has six on order), it was something of a disappointment that in the immediate post-war years no suitable British aircraft was available. He described Qantas as long-range operators and once more mentioned the company's determination never again to be in the position (as during the last war) of being cut off from other parts of the world by any hostile occupation of key points on its routes.

Mr. Hudson Fysh said that he thought the Britannia was an exceptionally promising machine, but he was wondering whether by the time Britannias could be in service with his company first-class passengers would like to fly behind airscrews rather than with

CIVIL AVIATION . . .

the aid of pure jets. He gave the impression that the most likely order for new equipment was for Series III Comets, but he was obviously most interested in what he had heard of Vickers' plans for a four-jet transport similar to the Valiant bomber.

Although the longest stage-lengths flown by Qantas were those required on the new Cocos-Mauritius route to Johannesburg, Mr. Hudson Fysh regarded this as exceptional, and said that any aircraft that could handle the Honolulu-San Francisco stage would be acceptable. It seems that Q.E.A. now await guaranteed performance-figures for Series III Comets and for the Vickers transport—they expect to receive them very early in the new year—and then, assuming that the decision is approved and money is forthcoming, a substantial order will be placed.

SOUTH AFRICAN NEWS

CORRESPONDENTS in South Africa report that Johannesburg's new Jan Smuts Airport is likely to be opened officially at the end of January next year and that it will be in full operation by mid-1953. The cost of the completed airport has been estimated as £6.2m (more than double the original cost), of which £3.5m have already been spent on construction of runways and official buildings. The present terminal is, of course, Palmietfontein, which is only 12 miles from Jan Smuts. The future of this airport is still undecided and its proximity to the new terminal may restrict its usefulness. One proposal is to hand over Palmietfontein to the South African air force.

Central African Airways are described as the prime movers of the joint scheme with B.O.A.C. and S.A.A. to reduce the cost of air travel between South Africa and this country. Mr. R. G. McCoy, the company's general manager, recently gave examples of the fares which would be offered by three grades of service between Salisbury, Southern Rhodesia, and London. A ticket on a "colonial coach" service would be £118, compared with a tourist fare of £132 10s or a "standard" rate of £164. The British independent companies, who have been offered the opportunity of developing colonial coach services feel, however, that there is insufficient scope for more than two grades of cut-fare services; in their view, the larger airlines must be restrained from operating tourist services along the colonial coach routes.

Earlier this year a sub-committee of the South African Transport Commission was set up to formulate a comprehensive air policy for the Union. The fact that its recently published report omitted all mention of the future administration of South African Airways in relation to South African Railways caused much unfavourable comment. It is now learnt that the sub-committee did make an extensive report on this much-vexed subject, but that its recommendations were rejected by the Government. In the view of the Government, the recommendations were outside the sub-committee's terms of reference, despite the fact that the National Transport Commission had specifically called for opinions on the prospect of divorcing the airline from South African Railways.

ONE FOR THE ALBUM: The unusual background for this father-and-son portrait is the cockpit of a B.O.A.C. Comet. Radio Officer Albert Coster (right) entered the airline business 18 years ago and has since flown some three million miles; his son John, with 300 hr to his credit, recently qualified as an engineer officer and was posted to the Comet Fleet. Coster Senior at present flies in Stratocruisers on the North Atlantic route. They form B.O.A.C.'s second father-and-son aircrew team, the other being Capt. L. V. Messenger and his son, Peter, a first officer.

MR. W. HUDSON FYSH (second from left), chairman of Qantas Empire Airways, contemplates the qualities of the Britannia during a recent visit to Filton. On his right, Mr. W. R. Farnes, the company's sales manager (aircraft division), demonstrates seating arrangements with the aid of a plastic-topped model; looking on are Capt. K. J. G. Bartlett, sales manager, and Sir G. Stanley White, deputy chairman of the Bristol Aeroplane Company. The visit is reported at the foot of page 511.

NEW YORK HELICOPTER SERVICE

THE first regular mail services to be operated by helicopter in metropolitan New York are due to be opened this month by New York Airways, who have three-S-55s on order. Like B.E.A., the company regards such services as a useful way of gaining experience of helicopter operations and intends to develop cargo and passenger routes in the future. It has been proposed that the helicopters which are initially being used to link the three airports of Idlewild, La Guardia and Newark should be permitted to use the flat roof of the New York Post Office as a "rotorstation."

BREVITIES

ACCORDING to the manufacturers, the compound-engined Lockheed Super Constellations which have been ordered by the Spanish airline Iberia will be used to open a new route linking Spain, the Canary Islands and Puerto Rico.

* * *

The figures for passengers carried, passenger-miles and revenue freight-tons flown by Central African Airways during July were the highest for any month in the corporation's history. The total number of passengers carried was 9,229, forty per cent more than in July 1951; the amounts of freight and mail carried increased by 16 per cent and 30 per cent.

* * *

Air France will inaugurate a weekly service between Paris and Tokyo on October 26th; Constellations will be used, and the journey time between the two capitals will be 57 hr. Another new service forming part of the Air France winter schedule will be that across the central Atlantic *via* the Azores or Bermuda between Paris and Martinique, Caracas and Bogota.

* * *

In a recent speech, Mr. Frank Piasecki, chairman of the well-known helicopter company, said that multi-engined rotorplanes carrying 50 passengers could be in service within four years "if the airlines would tell the manufacturers what they wanted." Possible airline interest was indicated in a speech on the same day by Mr. James Carmichael of Capital Air Lines, who expressed his belief that helicopters offered "much greater prospects than jet-powered airliners" for improved air services in the United States. The latter remark, however, should be taken in its context; the main message of Mr. Carmichael's speech was that jet aircraft did not at present fit into the American aviation picture . . . "I hope we don't get stampeded into jets just because of what the British are doing."

The New Zealand government states that it has been asked by the Dominion's aerial top-dressing industry to sponsor design and construction of an aircraft capable of meeting the industry's highly specialized needs. At present, the work is mainly carried out by Tiger Moths which "are not expected to stand up to the work for many more years."

* * *

Mr. Rolv Von Bahr, who is reported to have 7,000 hours flying experience in helicopters, was recently appointed by S.A.S. to investigate the needs and possibilities for helicopter services in Northern Norway. As a result, it is said, the company will begin experimental services between Harstad and Svolvaer next summer with a Westland Sikorsky helicopter, presumably an S-55.

* * *

Visual presentation of their aircraft's position throughout flight will be provided for passengers by an automatic screen map under development by the Decca Development Company. The device is a much simplified form of the Decca Navigator, as adopted by B.E.A. A moving dot of light will show the aircraft's progress on the passengers' screen, measuring 21in by 16in and containing a transparent map.

* * *

October 26th is the date announced by B.E.A. for the introduction of the new £8 eight-day return fares (reported in *Flight* last week) between London and Glasgow and London and Edinburgh. The reduction will also benefit passengers travelling between Manchester and Edinburgh (on this stage the new fare is £5, compared with £6 10s) and Aberdeen and between London and Aberdeen. Pionairs and Vikings will provide twice as many flights between London and Scotland as there were last winter.

EN ROUTE for Tokyo, where it will be used as an executive transport by the Asahi Newspaper Company, this Aero Commander attracted attention when it called at London Airport recently. Powered by two 240-h.p. Lycomings, the Commander is a 6/7-seater capable of cruising at nearly 200 m.p.h. The delivery flight from Oklahoma is being made by Mr. J. H. Ford, president of Fleetway, Inc. (a professional ferrying organization), and is in the nature of a route survey for future deliveries.

K.L.M. will inaugurate a weekly DC-6 service to Santiago, Chile, on November 6th, increasing the company's route mileage to 120,000, and bringing to 15 the number of North and South American countries served by K.L.M. Stops will be made en route at Frankfurt, Geneva and Lisbon. Heavy traffic is reported on the company's service to Tokyo, the frequency of which will be increased to twice weekly when winter schedules come into operation on October 26th.

FROM THE CLUBS

ON learning that the University of Southampton had decided to close its air navigation school, Cheltenham Aero Club recently acquired all the school's training literature and equipment as part of its plan to develop a full-scale flying training establishment. The club, incidentally, is a non-profit-making organization founded by ex-C.F.S. pilots some three and a half years ago. The newly acquired equipment includes a complete stock of training and test papers, plotting charts, aircraft loading graphs, and sectioned models of instruments and compasses. Towards the end of last month the club took delivery of a new Auster Aiglet Trainer, equipped with screened ignition, full blind-flying panel, extra wing-root tank, bench-type rear seat, starter and generator. It will be used mainly for advanced training and particularly for instructors' courses. This Aiglet Trainer is the first to be bought by a British club, and its acquisition is a sign of faith in the future of club flying in the Cheltenham district.

THE Association of British Aero Clubs and Centres has introduced a wings badge for pilots who have qualified for P.P.L.s on completion of a course of instruction as laid down in the A.B.A.C. pilotage standards. Club members who obtained "A" licences before the standards were introduced but who, in the opinion of their instructors, have subsequently reached an equivalent degree of proficiency, will also qualify for the badge. Designed by the freelance artist "Chris" Wren, the badge consists of chromium and blue enamel wings which span 2¼in; it may be obtained through A.B.A.C. clubs for 5s.

INVESTMENT: As reported above, the Cheltenham Aero Club recently bought an Auster Aiglet Trainer, the first to be obtained by a British flying club. Mr. Aubrey Reeves, the club's secretary, is pictured with the Aiglet after collecting it at Rearsby.

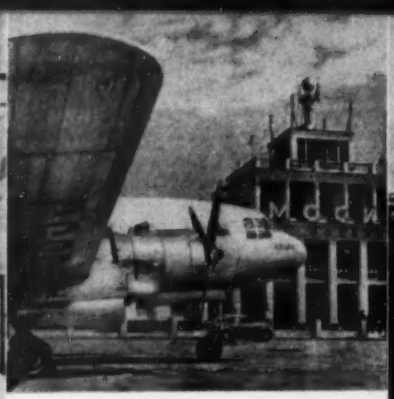
SEVERAL useful contests of airmanship were held at a recent At Home held by the Wolverhampton Aero Club. A pilot navigation competition was won by Mr. J. Bradley, who received the *Express and Star* Trophy. Power-on and power-off landing competitions were won by Dr. L. W. Hamp and Mr. B. Mould, who were, respectively, winners of the H. M. Hobson Trophy and the Webster Cup. One of the younger members, Mr. J. Strong, received the Chairman's Cup for winning an airmanship contest between pilots with less than 70 hours flying experience, particular emphasis being placed on forced landing ability. For older pilots (those over 50) there was another competition—for the Veterans' Cup, won by Dr. Hamp.

Wolverhampton pilots ended a fairly successful racing season the following week-end by winning two races staged during the At Home of the affiliated Derby Aero Club. Wolverhampton's C.F.I., F/L. S. Robinson, received the Harben Memorial Trophy for winning a race between four Hawk Trainers, and Mr. J. Bradley's Gemini took first place in the inter-club relay race to win for the visitors the Air Schools Trophy. Among the events held at Derby was the Woodward Trophy spot-landing competition, won by Mr. B. Lilley of the Derby Aero Club.

THE first annual dinner and dance of the Vintage Aeroplane Club is to be held at Denham on November 1st. The day will start with a navigation competition and pilots are asked to arrive at any time up to 2 p.m. After flying, which will finish at 4 p.m., tea will be available until 5 p.m., when the first A.G.M. will begin. Applications for dinner and dance tickets (15s single and 25s double) should be sent as soon as possible to the chairman.

MEMBERS and instructors of the Strathtay Aero Club completed 202 hours flying during September. Seven first solos were launched and three pupils qualified for private pilots' licences. One of the club's A.T.C. pupils, Cadet E. J. E. Smith, who was assessed as above average at the conclusion of a recent scholarship course of flying instruction, has been selected by Home Command to accompany the C. in C., Air Marshal Sir Ronald Ivelaw-Chapman on an extensive tour of inspection abroad.

MEMBERSHIP of the Blackpool and Fylde Aero Club continues to grow steadily, the total number now being almost 300. So far this year the club's aircraft have flown well over 1,000 hours, a figure which compares well with previous years. August was an especially good month; eight first solos were flown, bringing the total for the year up to 28, and seven members qualified for licences, including five A.T.C. cadets. The total number of P.P.L.s awarded to club members during the year has now reached 17.



Like most "Iron Curtain" photographs, these are of poor quality; nevertheless, they give a rare glimpse of Russian civil aviation. (Left) the waiting-hall at Vnukovo Airport. (Above) main terminal building with Il-12 in foreground. (Right) Airport staff with radio equipment and a timepiece of less recent origin.

MOSCOW'S MAIN AIRPORT

By JOHN STROUD

ALTHOUGH Vnukovo, Moscow's main airport, is virtually unknown outside Russia, it is almost certainly the most important airport in the U.S.S.R., and it handles over half as many regular aircraft movements as London Airport. The Russian capital is served by a total of four airports which are regularly used by scheduled passenger services: Vnukovo, which handles the greatest proportion of traffic, Lyubertsy, Bykovo and Ostafevo. In addition, there is a nearby flying-boat station from which services operate to the Arctic areas.

It is not easy to find out when Vnukovo was first employed as the main airport for Moscow, but it was certainly being used as such in the early 1930s and it appears that the main terminal building at present in use was erected on the site used by a smaller building in pre-war days. Vnukovo is fairly extensive, with paved runways of at least 2,000 yards in length and capable of taking large four-engined aircraft. The approaches are good, the area being generally flat, although there are some forests fairly close by.

The main terminal building consists of a rather massive two-storey block arranged around a main central hall. There is a third-storey centre-section on the airport side and this in turn is surmounted by the control tower. During the war the whole structure was camouflaged, but it has now been completely renovated and cleaned. This block is fenced off from the passenger embarkation area, which is reached through gates, as at many

(Right) Complimentary vodka? An Aeroflot stewardess about her duties.

American airports. There is an attractive open-air restaurant on the second storey balcony overlooking the airport. All windows in the building have double glazing to keep out the winter's cold. Runways have lighting for night operations, buildings and masts are topped with red obstruction lights and floodlights are mounted on the terminal building to illuminate the loading area.

No information is available on hangar and workshop accommodation. Many aircraft are normally parked on the grass beside the taxi-tracks, over two dozen twin-engined Il-12s having been seen so parked at one time.

Winter and summer operations are not believed to vary greatly. The average number of monthly aircraft movements in and out of Vnukovo is about 2,436, most of these being made by 28/32-passenger Il-12s and 21/28-passenger Li-2s.

Russia does not contribute to the otherwise comprehensive world airways timetables published in this country, but details of airline services do appear in an overall Soviet timetable covering all forms of transport. In addition, Aeroflot publishes its own international timetable (with a coloured cover showing the Il-12), but copies are not easy to come by. As might be expected, the company is not a member of I.A.T.A., and it pays no commission on bookings made by travel agents in this country.

The latest available information shows that the first service out of Vnukovo departed at 0105 hr local time, the peak of departures was reached between 0700 and 0800 and the last departure was at 2030 daily and 2305 twice a month. The first incoming service did not land until 0850, the peak was reached between 1700 and 1800 and the last aircraft arrived at 2330. Between 0800 and 2000, traffic was fairly evenly distributed, with a convenient lull at lunchtime. In addition to the scheduled services, there are numerous cargo flights by modified Il-12s and Li-2s.

Aeroflot maintains the Soviet railway practice of providing "hard" and "soft" classes on its aircraft. In Li-2s the first two rows of seats are as in Western airliners, while the folding inward-facing seats, familiar in war time, are let down for "hard" customers.

(Left) Using every available reference, the author has built up these sketches of the Vnukovo terminal building as seen from the road (above) and from the tarmac. The new photograph reproduced at the head of the page confirms their authenticity.

ARDENT—THE THREE PHASES

The Big Air Defence Exercise: Narrative and Appraisal

IN last week's issue appeared a detailed account of the first phase of Exercise Ardent, the largest air-defence exercise held in the United Kingdom since the war. On page 517 of this issue will be found some further notes on early Ardent briefings, together with a first-hand account of a raid in a Bomber Command Washington. Also in this issue (pages 500-501) is a set of specially commissioned artist's impressions of activities at four stations.

We now take up the story of Phase II, which began at 2200 hr last Thursday, October 9th, with a maximum-effort attack by Bomber Command, principally centred on London, Liverpool, Bristol and Sheffield. Seven main formations were involved, ranging over the entire country; as before, live practice-bombs were dropped on ranges in Yorkshire, Salisbury Plain, and Luce Bay, south-west Scotland. The spearhead of the attacks was a Canberra force which came in from the south, crossed the Channel near Beachy Head, and then turned westwards to their objective at Bristol. These Canberras flew in groups at various heights above 11,000ft. A concurrent strike was made by Mosquitoes of the Belgian Air Force against night fighter bases.

Ardent's third phase opened in perfect weather at 1000 hr on Saturday. U.S.A.F. B-50s came in across the North Sea to raid Glasgow and Liverpool, and went on to attack London. Large numbers of fighters from the Continental air forces and 2nd A.T.A.F. acted as simulated raiders against ports and industrial areas in the South and the Midlands; in addition, Belgian and Dutch F-84s attacked London, while F-84s of the French Air Force went to Bristol. There were numerous 2nd A.T.A.F. strikes against airfields—principally in eastern England—while the Canberras ranged far and wide to make attacks on Cardiff, Carlisle, Glasgow and Liverpool. A second airborne drop of 100 paratroops was carried out very successfully in the early afternoon against an objective in East Anglia.

The principal Saturday night operations were centred on London. Medium bombers and Canberras were involved, flying at from 12,000ft to 30,000ft. They approached the capital from several directions shortly after midnight, employing most complex tactics. Night-fighter sorties were numerous; many interceptions and kills were reported but, so far as could immediately be ascertained, the Canberras were untouched. Other night strikes were made on Bristol, Birmingham and Cardiff.

Many airfields in East Anglia and one in Oxfordshire were shaken up at 0930 hr last Sunday morning by low-flying American and Dutch F-84s; similar attacks were made by aircraft of the Royal Navy in the West Country. No Belgian aircraft were involved on this day, the country being in the throes of national elections. B-50s again found targets near London, including the fighter stations of Biggin Hill and North Weald. The Canberras went to Liverpool and Bristol, and what must have been a thrilling sortie was flown by Dutch F-84s against an objective in Birmingham.

Ardent closed with over 100 last-light sorties against London by Bomber Command, beginning with a twilight raid on the Ford works at Dagenham.

General Appraisal

Initially, it must be appreciated that the analysis of so vast an exercise will occupy at least the remaining months of this year, but some preliminary observations can be presented.

The air defences of the United Kingdom are, of course, given constant practice with each of the many types of raiding force which may be met. Exercise Ardent was designed to correlate all such practice with all types of raiding force met simultaneously under conditions of war intensity. Previously, such exercises have been severely limited in that bombers have only been routed over "manned" areas; the employment in Ardent of over 20,000 non-regular personnel has made possible, for the first time, almost complete coverage—and, consequently, unrestricted bomber operations. In fact, the only weak links have been the rather small size of the raiding forces, and the necessity for respecting civil air traffic rules. Perhaps the small size of the bomber forces has not been a great disadvantage; one of the principal tasks facing the Air Staff has been the examination of problems of relative velocities and altitudes which apply equally well to a small force as to a large one.

Defence on the whole has been good, only the Canberras achieving much success. It may be emphasized here that, to establish a kill, the fighter has to record a specific number of seconds of aimed fire, allowing correct deflection as recorded by the cine camera. The aim of the fighters is, of course, to achieve interception before the raiding force reaches the British coast. This year interceptions have been achieved much farther out than ever before, and in an extremely efficient manner.

Aircraft Types Involved

English Electric Canberra.—Many sorties were flown by B.2s, upon which an artificial "nothing over 35,000ft" limitation was generally imposed. Even at this height, Canberras were properly intercepted only four or five times—twice by R.C.A.F. Sabres, and once each by Venoms and Meteors. The Venoms—from the Central Fighter Establishment—were very lucky to "drop into the most vital part of the raiding force" as the Vice-Chief of Air Staff put it. But, even cruising below 500 m.p.h. the Canberra will, it appears, always get through in small numbers; time is the dominating factor. At 45,000ft, it seems, few fighters could normally *expect* to intercept before reaching the target area, although it should be remembered that the higher the bomber is flying the farther away can it be detected by radar. It was even stated that several P.R. Canberras at this height were not detected by the control and reporting organization.

Boeing B-50D.—This fine bomber has been described as "the perfect target" during Ardent; none reached its objective without being intercepted, and it appears that nearly all were eventually "shot down." We might point out that the period of aimed fire required for a B-50 kill is long; but even the Meteors and Vampires had no difficulty in "killing" the big medium bombers long before reaching the British coast.

Boeing Washington.—Slower than the B-50, the R.A.F. Boeing is, apparently, no easier to destroy—but is still something of a sitting target at 25,000ft. The Washingtons generally operate at night, and are easy to catch by the night fighters; they leave a big "blip" on the screen which can be picked up many miles away.

Avro Lincoln.—The ageing Lincoln is on the way out. It is a strain to expect crews to work for hours at 20,000ft or higher in a rather noisy, cold, and unpressurized aircraft. It cannot test the efficiency of modern fighters. (Roll on the 698s!)

de Havilland Venom.—Probably the best high-altitude performer of all—at present—the Venom was employed by both sides in Ardent. As a bomber it worked at low and high altitudes with conspicuous success; as a fighter it showed itself the only fighter capable of tackling the Canberras and of bringing its guns to bear with any consistency. Even the Sabre had difficulty in doing this.

North American F-86 Sabre.—Used solely as an intercepter, the F-86E has plenty of speed. Climb is reasonably good—but not equal to the Venom's—and the Sabres were able to catch the Canberras at 35,000ft. (Other fighters could only get near the Canberras if they were able to wait for them, or come in from the beam.) But several Sabres reported that their quarry jinked away at the crucial moment with a higher rate of turn than the Sabre could itself muster, even with its "all-flying" tail. Other bombers—even the F-84—did not, apparently, worry the North Luffenham pilots at all.

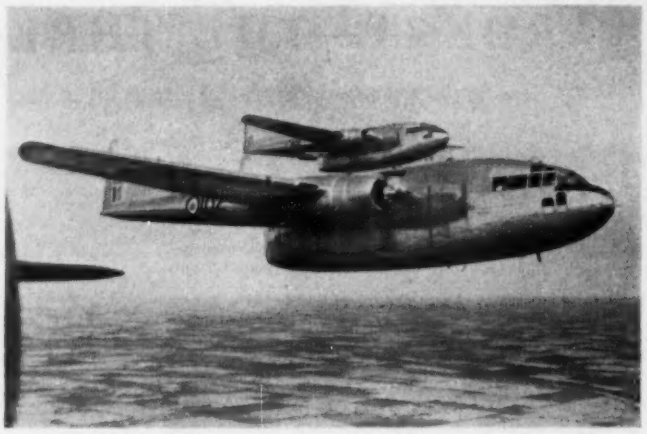
Gloster Meteor.—Excellent scrambles were made by Meteor squadrons; there was an example—typical, we believe—of a squadron of nine aircraft being airborne just over one minute after being told to go. The good climb of the Meteor, together with the "British" armament of 20 mm cannon, make it a very good bomber-destroyer; but the Canberra is rather too fast and high-flying. Neither night nor day Meteors can effectively overtake a Canberra if the bomber is more than a few degrees elevation higher; and the small Canberra "blip" is difficult to see at a distance—which can adversely affect the accuracy of the G.C.I. direction.

de Havilland Vampire.—Although the Vampire lacks the climbing powers of new types, it is still a superb destroyer of piston-engined bombers. The Vampire squadrons found the B-50 a particularly easy customer to handle, and could carry out correctly aimed firing on such aircraft without trouble.

Republic F-84 Thunderjet.—Four air forces used F-84s to simulate bombers. The Dutch were particularly daring, and went right into England—sometimes at low altitudes—to pinpoint targets. Although such "rats" are particularly difficult to intercept, the Meteors (and probably others) managed it, and on numerous occasions. The otherwise excellent handling of the F-84 is severely hampered when a heavy external load is carried, and the fighter-bomber is reported to have been fairly easy to intercept if caught before its target.

SERVICE AVIATION

Royal Air Force and Naval Aviation News



NO MAYO COMPOSITE, but two C-119 Fairchild Packets of the Royal Canadian Air Force in open formation. The Packet will carry 64 fully equipped paratroops or 30,000 lb of cargo.

Laurence Minot Trophy

ON Wednesday last, Marshal of the R.A.F. Sir John Slessor was due to present the Laurence Minot trophy to No. 90 Squadron, Bomber Command, at R.A.F. Station Marham, Norfolk. It was to be received by the commanding officer, S/L. W. R. Sloane.

Sir John has been visiting Norway, where King Haakon has conferred on him the Grand Cross of the Order of St. Olaf.

R.Aux.A.F. Badges Presented

A CEREMONY linking three famous R.Aux.A.F. squadrons — Nos. 600 (City of London), 601 (County of London) and 604 (County of Middlesex)—with the Borough of Hendon took place at the Hendon Council Chamber on Monday, October 6th.

To mark the traditional link between the three units and the Borough which was their home for so many years, the badges of the squadrons were handed to the Mayor of Hendon, Ald. S. R. C. Sumpter, J.P., F.B.A.A., by the Commanding officers of the squadrons; S/L. J. P. Meadows, D.F.C. (No. 600), S/L. C. C. McCarthy-Jones (No. 601) and S/L. A. Deytrikh, A.F.C. (No. 604). The badges will be subsequently placed on the walls of the council chamber.

In his address, Alderman S. R. C. Sumpter said: "We remember with pride the three squadrons represented here this evening, who trained at Hendon before the war, and who gave up their leisure hours to ensure that when the need arose they were ready to play their part in the defence of freedom and the protection of their country.

"As you all know, when war broke out in 1939, they became fully operational and served with distinction in various parts of the world throughout the long years of the War and until the conclusion of hostilities.

After recounting the histories of the squadrons, the Mayor concluded: "I feel it is singularly appropriate that this ceremony should take place in this Borough which saw the early development of aviation and aircraft construction, and has maintained its link with, and interest in, flying and it is of interest to note that the crest of the Borough Arms consists of an aeroplane propeller and an airman's wings."

New C.A.S. for Pakistan

TAKING over from A. Cdre. G. B. Keily, D.F.C., A.F.C., G/C. L. E. Jarman is to be the new C.A.S. of the Royal Pakistan Air Force. He will serve in the rank of air commodore.

Esher Trophy Presented

AT a ceremonial parade at R.A.F. Station Doncaster, Major General the Earl of Scarbrough, Lord Lieutenant of the West Riding, presented the Esher Trophy to S/L. L. H. Casson, the C.O. of No. 616 (South Yorkshire) Squadron, R.Aux.A.F.

After inspecting the guard of honour, Lord Scarbrough inspected the squadron, accompanied by Air Marshal Sir Basil Embry, C-in-C. Fighter Command. He then addressed the parade, and in congratulating the squadron on its success, remarked that the trophy had never before been won by a Yorkshire squadron and that Yorkshire in general, and the West Riding in particular, was very proud of the achievement.

Memorial Service

A MEMORIAL service for Air Marshal Sir Richard H. Peck was held at St. Margaret's, Westminster. Canon Charles Smyth officiated, assisted by the Chaplain-in-Chief of the R.A.F., Canon L. Wright. The Lesson was read by Air Chief Marshal the Hon. Sir Ralph A. Cochrane, Vice-Chief of the Air Staff.

Reunions

NO. 4 NAVAL FIGHTER WING'S fifth annual reunion will be held at Restaurant Pére Auguste, London, on Saturday, November 1st. Particulars from Lt.-Cdr. G. C. Baldwin, H.M.S. *Eagle*, c/o G.P.O. London.

No. 1 Carrier Group. Lt. F. Cawood, R.N., is organising a reunion for officers who served in Nos. 1834, 1836 and 849 Squadrons during 1944 and 1945 in H.M.S. *Victorious*. His address is R.A.F. Flying College, Manby, Louth, Lincolnshire.

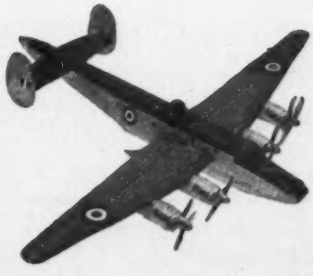
The seventh annual reunion of No. 87 Squadron will be held at the New Inn Restaurant, London, S.E.1, on Saturday, November 8th. Tickets from A. B. Ebrey, "Seaforth," Southfields, Hessle, East Yorkshire.

The Pathfinder Club is holding an informal party on October 29th to celebrate the start of its eighth year at 115 Mount Street, Berkeley Square, London. The 10th Pathfinder Ball is to be held at the Dorchester Hotel, London, a month later, on November 29th.

HENDON HERALDRY: The badge of No. 604 (County of Middlesex) Squadron, R.Aux.A.F., being handed to the Mayor of Hendon by the commanding officer, S/L. A. Deytrikh, A.F.C.

LOCAL INTEREST: A.V-M. Edwardes-Jones and other R.A.F. staff officers inspecting the Auster Ambulance/Freighter during the recent Air Ministry/A.A.F.C.E.-sponsored casualty-evacuation exercise "Stirrup Cup," held in the British Zone of Germany.

AVRO SHACKLETON MARK 2



The Avro Shackleton Mark 1 was designed especially to meet the requirements of Coastal Command. It has proved to be a great aircraft for its allotted task of long range ocean patrolling. Now the Shackleton Mark 2 . . an even greater aircraft . . is soon to join Mark 1 in the squadrons of Coastal Command. Incorporating all the performance characteristics that have made the Mark 1's so outstandingly successful, the Mark 2 has these additional operational improvements : hard-hitting nose armament, consisting of two 20 mm. cannon ; retractable radar " dustbin " ; retractable tail wheel and faired tail fuselage housing an observer's station. The enormous capacity of the bomb-bay is unaltered and the Mark 3 Airborne Lifeboat is carried on air-sea rescue missions.

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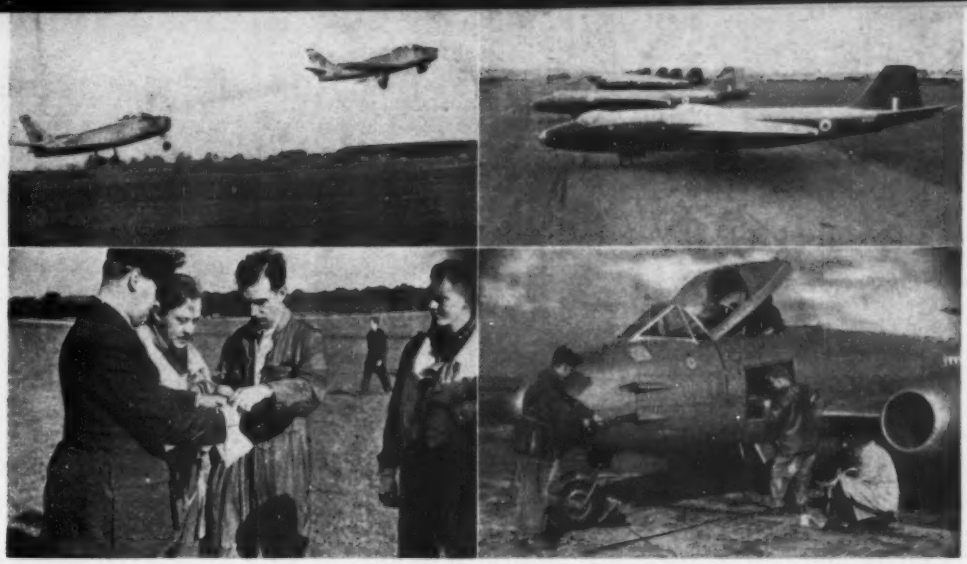


(Top, left) Canadian Sabres of No. 441 Squadron R.C.A.F. scramble from North Luffenham. (Top, right) The employment of Canberras, seen here at Binbrook, gave the night fighters some hard work—in which they were assisted by bright moonlight. At the bottom are photographs from Biggin Hill showing pilots handing in all their belongings to the adjutant before flying, and a Meteor of Mr. Churchill's squadron being re-armed
"Flight" photographs

Ardent—The Three Phases . . .

IF the preliminary reports and expressions of senior officers to be heard immediately after phase one of Exercise Ardent had finished give an accurate picture, the defences were particularly successful in their efforts to deflect attacks and destroy the bomber formations. The experiences of several *Flight* observers with participating squadrons were published last week, together with condensed accounts of such raids and operations as security permitted to be mentioned. Some of our representatives could not, however, avoid a feeling of unreality when studying the communiqués.

The Vice-Chief of the Air Staff remarked in an early briefing that there were three reasons for a degree of artificiality. The first, that it was almost impossible to umpire air combats and assess accurately the bomber and fighter losses; secondly, that for the sake of anti-aircraft and Royal Observer Corps participants it was desirable to put the attacking aircraft over as many posts and areas as possible; and, third, that civil aviation must go on without interruption.

Before this sixth and most comprehensive post-war exercise started, Air Marshal Sir Ralph Cochrane had sent out a signal to all subordinate commanders, part of which read as follows:

"You will by now have seen the Ardent Intelligence Summary. The country is facing a very diverse threat and a very strong threat. You are aware of the ability of the enemy's long-range force to carry the atomic bomb. There is no doubt in my mind that he will use it right from the start. I wish, therefore, to leave one very clear impression upon your mind. It is that our major responsibility is the destruction of the atomic bomb carriers before they reach their targets."

The actual plan of attack for the exercise had been prepared by an Air Ministry committee, and the defence forces had no prior knowledge of the actual plan of attack. Thus it would be very wrong to think of Ardent in terms of a set piece. In practice, because there are no means of turning a blind radar eye to bomber forces taking off from home bases in preparation for a raid, the defences would naturally know that potential attacking forces were airborne and headed out over the coastline, even though the aircraft flew beyond radar range before returning. This would be particularly useful in giving prior warning of the possibility of Canberra attacks. The inclusion for the first time of Canberras, permitted several new tactics to be tried out. The Canberras were described by the S.A.S.O. of Bomber Command as the most flexible of the bombers employed, but from reports received, these aircraft were not generally operated at their maximum altitude.

Activities during phase two of Ardent, which took place during the hours of darkness of Thursday night and Friday morning, and phase three, during last weekend, are given pride of place on the opening Service Aviation page. On pages 500 and 501 appear impressions by our artist, Gordon Horner. There follows a personal account of a raid in one of Bomber Command's Washingtons.

Two night attacks were made during one phase of Ardent by the Bomber Command Washingtons based at Coningsby; and on the second of these space was found in one aircraft for an operationally-redundant journalist. We had arrived on the station at about 3 a.m., after the first force had taken-off, and had found security guards, awake and armed, enquiring our identity. A special light-alloy rectangle, mystically imprinted, was apparently required for entry to the Operations block.

Thus equipped, we were able to pass safely the guardian airman that evening, and to obtain a general view of the operations, such as we reported last week, from F/L.s Shields, Hill and Davies: gunnery, bombing and radar specialists respectively. After the specialist briefings for the crew members had taken place, we joined F/L. M. Crosbie and his crew, with whom we were to fly, for the general briefing. W/C. A. D. Panton gave details of the night's trip; it was to be short (about six hours), and the targets were to be Glasgow, Redesdale bombing range, and York. Simulated attacks by radar were to be made on the two cities, and a visual attack, using practice bombs, on the range. The met. man took over, forecast good weather, and received a polite round of applause. G/C. G. A. Walker, the Station Commander, then concluded the briefing.

In the squadron crew rooms, flying suits and Mae Wests were put on, the equipment and rations for the flight were checked. We then moved out to the aircraft, and the thorough pre-flight inspection began. We were to carry a crew of nine; captain, second pilot, two navigators (one radar operator, one plotter and bomb-aimer), engineer, signaller and three gunners (one of whom was the central fire controller and the other two the mid-fuselage scanners). Normally, in addition, a rear gunner is carried.

As the engines were warming up, the lights of other aircraft, taxying out, could be seen. The movements were well co-ordinated, and the B-29s took off at approximately 50-sec intervals. From the bomb-aimer's position in the nose, the climb seemed smooth and quiet, and at 16,000ft we levelled out and set course across England for Northern Ireland; our attack on Glasgow was to come from the west. The weather, as forecast, was good: a clear moon shone on a layer of stratocumulus below—ideal for the fighters, too.

We moved to the forward navigator's position to watch the target coming up on the radar screen, and found a very clear picture, with the River Clyde distinctly shown. Over this target the scanners reported a Meteor N.F.11 coming in to attack; navigation lights were blinked in sign of recognition, and the converging silhouette disappeared. Course was then set for the Redesdale range. A glance through the transparent hatch into the huge bomb bay showed the sole occupant to be a tiny 25-lb practice bomb in incongruous isolation.

The target indicators showed up clearly at the second target: the run-in was made and our bomb was dropped—with an accuracy described as "good." Out over the North Sea, then back for our third attack, on York railway station.

As dawn broke we approached Coningsby, and found there a thick layer of ground mist. But no trouble was experienced in bringing the aircraft in. With the performance of the aircraft itself the crew were very pleased; and it is indeed an effective and comfortable machine. We thought, however, that in this exercise full use was not made of its capabilities.

BY CANBERRA TO NAIROBI

In the hot sun at Eastleigh: Air Chief Marshal Sir Hugh P. Lloyd with A.Cdre. L. T. Pankhurst, A.O.C. East Africa.

AT a recent luncheon, the Secretary of State for the Colonies, Mr. Oliver Lyttelton, said: "The aircraft is the most important single material thing in the whole of the Colonial Empire set-up. . . ." He was thinking largely of civil aircraft, and the very real manner in which they have made the British Empire less "far-flung" is typified by the very respectable B.O.A.C. Hermes schedule of 24 hr 10 min to Nairobi. How much more potent, then, is the world-shrinking ability of the Canberra, which recently completed the same journey in rather less than ten hours total elapsed time.

Ever since the introduction of the Canberra to Bomber Command, Air Chief Marshal Sir Hugh P. Lloyd, K.C.B., K.B.E., M.C., D.F.C., the Command A.O.C.-in-C., has used it as his personal transport on overseas journeys; it may be remembered that he flew to Canada and the U.S.A. and back in one last March. Another eminent Canberra passenger is, of course, the Vice-Chief of the Air Staff, Air Chief Marshal Sir Ralph Cochrane, G.B.E., K.C.B., A.F.C.

Sir Hugh's presence in Nairobi was due to the completion of the African survey work which No. 82 Squadron—one of the most scattered units in his command—have carried out for the Directorate of Colonial Survey. Since 1946 the Lancaster survey aircraft of 82 Squadron have been based in Africa and, although they have been centred on Eastleigh Airport, Nairobi, detachments have operated from almost every part of the continent.

The completion of the survey was marked by ceremonies at Eastleigh beginning on Monday, September 29th. The major part of No. 82 Squadron have now returned to this country, and the remainder are expected next week.

The Canberra used by Sir Hugh was a standard B. Mk 2 from No. 12 Squadron at Binbrook, blue-painted, tip-tanked, and bearing—in addition to squadron insignia—the Air Chief Marshal's flash of four stars, as seen below. W/C H. P. "Pat" Connolly, D.F.C. and Bar, A.F.M.—Binbrook's wing commander flying—was the pilot; the navigator was the station navigation officer, S/L. D. Clare, D.F.C. And the following is the story of the flight as it was told to us last week at Binbrook.

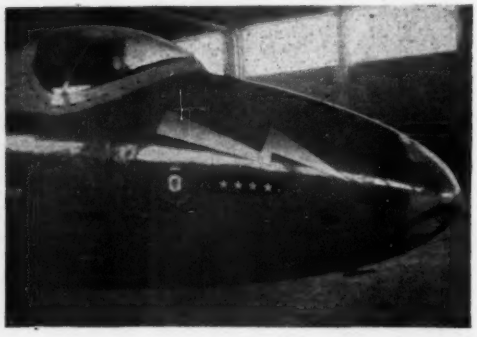
Flight planning was done at Binbrook; the Canberra was then flown down to London Airport, partly for Customs clearance and partly to facilitate timekeeping, for it had been decided that the flight would be an excellent opportunity of establishing a new world point-to-point record. At London, the Canberra was placed in the charge of Mr. Kent, the tarmac manager at B.E.A.'s new base; and W/C. Connolly spoke very highly of the services of the B.E.A. unit, and of the airport traffic control and meteorological staffs.

The take-off was scheduled for 01.00 (B.S.T.) on Sunday, September 28th. The evening was cold, and rather damp, and the canopy of the Canberra was soon covered with dew. The Perspex cannot be reached from the ground and there are no windscreen wipers or alcohol sprays. W/C. Connolly had, therefore, to open his circular direct-vision panel while taxying out in order to follow the taxi lighting. He then lined up on the runway visually, set his directional gyro, closed the direct-vision panel, and took off blind. Not until the Canberra was airborne did the condensation blow away. The time was then 01.03 a.m.

After passing over the official timekeepers of the Royal Aero Club, course was set for Paris along airway Amber 1. But the Canberra soon climbed above the airway system, and Paris was passed after about thirty minutes. Beam winds were met, and cloud and darkness obscured all sign of the ground. The Alps then approached—unseen—and, concurrently, other things happened which engaged the attention of all on board. But, eventually, everything was returned to normal and W/C. Connolly "turned the taps right up." After going through a cold front over Southern Italy, the Egyptian coast was met at dawn—the first land seen. The Canberra touched down at Fayid, in the Canal Zone, at 04.27.

In spite of the early hour, the bomber was soon surrounded by swarms of soldiers and airmen, all intensely interested. But they cannot have hampered the refuelling crews, whose performance was splendid. A brief discussion was held with A.V-M. H. V. Satterley, C.B., C.B.E., D.F.C., A.O.C.-in-C. Middle East, and with G/C. Dennis Finlay, O.B.E. (brother of the hurdler), the Station Commander. Then the Canberra was off, 58 minutes after touch-down. Sunday was brilliantly sunny, and

W/C. H. P. Connolly is seen (left) receiving the official time for the outward journey from one of the Nairobi observers, W/C. A. N. Francombe, D.S.O., M.B.E. Back at Binbrook (below) the Canberra B.2 is resplendent in the squadron crest and gold "flash," with the Air Chief Marshal's four stars added beneath.



Cup and Lip

BY BERNARD HOLLOWOOD

IT is Sunday morning. The newspapers have just been pushed through the letter-box, birds are pecking at the milk-bottle caps, the cat is sitting patiently on the window-sill and a troop of scouts or cadets blares down the street. You awake.

Consciousness returns. You light a cigarette. Sunday.

You slide out of bed and down the stairs. This, sir, is the day of the week when *you* get the breakfast. Tea, toast, butter, eggs, salt . . . anything else? No, that's the lot. The tray looks fine. You push the door open with a slippered foot, climb the stairs very very carefully . . and just as you enter the bedroom you stumble.

The tea swims into the saucers, the toast becomes soggy. It is a sad moment. "The deterioration," you say, trying to make the best of a deplorable situation, "is due to inadequate transport facilities and careless handling. Sorry!"

A common enough complaint. Goods of all kinds leave the producer "factory fresh" and reach the consumer substantially below par.

What about aviation fuels? Well, there could be many a slip between the Fawley refinery and the aircraft fuel tank. *Could* be. But the *Esso* transport and storage system has been designed to avoid butterfingers.

Consider the case of one drop of fuel, a junior member of one of the families of aviation fuels bred at Fawley. He leaves the refinery with a strong bodyguard. He is

conducted to an ocean tanker, piped aboard and led away to a private suite. At the end of the voyage he is housed in a strong point known as a Main Storage Terminal, and from here he is eventually moved—by barge, rail tank wagon or road vehicle—to a Bulk Storage Depot.

Another road trip and he is at the airport, safe and sound in Airfield Storage, ready for the next thirsty aircraft.

Now what precautions are taken to ensure that there is no stumbling, no muffed catches? He reaches the aircraft engine uncontaminated by contact with the dusty, humid, grubby outside world—how? It's a simple enough answer. Eternal vigilance.

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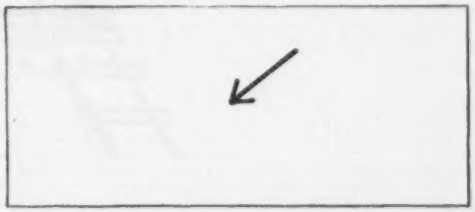
Remedial treatment is seldom necessary. If it is, then the consultants put their heads together. At airports Esso use five micron filtration. (One micron is one millionth of a metre—just a minute, we'll get the artist to draw one for you. . . .)



Filtration of this order eliminates all foreign bodies, little drops of water, little grains of sand and animalcules that have been known to insinuate themselves into aircraft fuels—even the best of aircraft fuels. . . .

It is *Monday* morning. Breakfast is ready. No stumbling this time. No soggy toast, no swimming saucers: the expert is on the job. Yes, transport is a job for experts whether the freight is tea and toast or aircraft fuels. Yes—

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BRITISH EUROPEAN AIRWAYS

BY CANBERRA TO NAIROBI . . .

the crew enjoyed wonderful views as they flew down the Nile valley; the horizon was generally about 300 miles distant, and some visible mountain ranges were farther away than this. Slight head-winds were now being encountered, which gradually changed to quite bad weather. Khartoum was passed soon after 8 a.m.: the Canberra held its altitude for two more hours, and then began to let down for its destination.

Towards the end of the run, the Air Chief Marshal was keenly map-reading; and W/C. Connolly was anxiously searching for Nairobi. At the low altitude—almost "on the deck"—at which they were flying, the Canberra was buffeting furiously at full speed, and burning fuel at a great rate. With only a few more minutes to go before the "ten hours" from London would have been up, and with fuel for only a few minutes' flying remaining, Nairobi appeared; and W/C. Connolly took the Canberra straight down the middle of the airfield, flat out. Luckily, the timekeepers were alert; and the Canberra then turned on to its approach.

They were nearly an hour ahead of schedule, and the 82 Squadron guard of honour were resting in a hangar. As the Canberra roared overhead they woke with a start, and, as W/C. Connolly levelled off for his landing, he saw them pouring out, hastily clutching their rifles. The landing was made at 10.58 a.m., the total elapsed time being 9 hr 55 min.

They were met by the A.O.C.-in-C. East Africa, A. Cdre. L. T. Pankhurst, C.B.E., and by many other dignitaries. The Lancaster squadron was lined up for inspection with the guard of honour; and the Air Chief Marshal carried out his inspection at once, still in his high-altitude flying kit.

Four days were spent in Nairobi, during which time none of the Canberra trio was permitted very much sleep. The major function was a farewell dinner held in the Mess at Eastleigh; 82 Squadron were the hosts, with W/C. Wise in the chair. The Acting Governor of Kenya, the G.O.C. and his wife, the A.O.C.-in-C., and all other military and civic leaders, made the dinner a fitting ending to No. 82 Squadron's work in Africa.

During their stay, the Air Chief Marshal and his crew visited the Kenya Game Park; they were entertained by Max Nightingale on his farm, and by Jack Sutherland—a famous R.A.F. pilot, who now does anti-locust flying while following his profession as an architect—and, perhaps above all, they were royally looked after by the Aero Club of East Africa and by 82 Squadron themselves.

On the homeward journey, the Canberra took off at dawn on Friday, October 3rd. Winds were still unfavourable, but better time was made than on the way out; unfortunately the return flight was not officially observed. A stop of 1 hr 5 min was made at Fayid, where service was again excellent; course was then set for England. The Canberra put down at Benson, Oxon, to set down Air Chief Marshal Lloyd and to clear Customs; it was then taken straight back to Binbrook. We saw the aircraft the next day—it had popped five rivets, but otherwise might have come straight from the Preston factory.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns; the names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Controlled Braking

THE Editor's impressions of the Universal Freighter (*Flight*, September 19th) make interesting reading, but the statement that "the braking would profit from Maxaret" may not be quite understood by some readers. "Maxaret" does not refer to the attentions of a particularly efficient ground engineer, but is the patent name of an automatic-braking (or anti-skid as the Americans call it) device.

The Maxaret is but one of several such devices now available which are likely to see ever-increasing use on tandem undercarriage layouts, such as those on the Boeing B-47 and B-52 jet bombers, and on braked bogie units.

In addition to increasing braking efficiency, the devices, by releasing the brakes as skidding commences, prevent serious skidding—hence the aptness of the American term. On bogie units they help to counter the effects of the transference of the load to the forward wheels as the brakes are applied.

The devices do not, however, as is commonly supposed, reduce tyre wear. Admittedly the severe wear experienced during a violent skid is eliminated, but, as the brakes are working at maximum efficiency, the tyres are doing the maximum amount of work and are actually at the point of incipient skid throughout the landing run and tread wear is thus increased.

London, S.E.19. MAURICE F. ALLWARD.

[In expressing his views, Mr. Allward does not mention that "Maxaret" is a Dunlop development. A similar device is the Westinghouse "Decelostat."—ED.]

High-speed Research Aircraft

THE 1952 S.B.A.C. Show this year once more emphasized the lack in this country of a really high-speed research machine. Recent articles and Press releases in America have shown us that the N.A.C.A. have now implemented their policy of testing a family of research aircraft. They now possess the Bell X-1 and X-2, the Douglas Skystreak and Skyrocket, the Convair XF-92 and the Northrop X-4. At least two of these aircraft have exceeded the speed of sound by a handsome margin, the Skystreak probably having attained very nearly Mach = 2.0. In addition, the U.S. possess the Bell aircraft with variable-sweep wings—of great importance when considering Mach numbers greater than 1.5.

Against this galaxy we can point to our delta-wing aircraft, which are only one branch of the necessary family of aircraft, and, formerly, the DH 108, which fulfilled a similar function to the Northrop X-4. We also possess prototype military aircraft, probably the finest in the world in their class, capable of exceeding M = 1.0 by a certain margin.

The field of supersonic aerodynamics is so wide that it is entirely necessary to carry out a large amount of full-scale testing if its problems are to be adequately understood. The design of future military aircraft will require more and more information on Mach numbers of the order of 1.5 to 2.0 and above, which will not be forthcoming if complete reliance is made on model tests.

Lacking specialized research aircraft, our high-speed-flight research programme is largely dependent on types of military aircraft at present in production in this country; the design of these types can obviously make no concessions to specialized research needs. There is, therefore, an immediate need for the construction of a family of high-speed research aircraft similar to those of the American programme. It should be possible, by scaling-up existing types of rocket motors such as the Snarler and the Beta, to construct small aircraft with a wing area of less than 250 sq ft, capable of attaining Mach numbers in the range of 1.4 to 2.0.

Such aircraft might retain some common components such as undercarriage (and, to a certain extent, fuselages) in the same manner as the Vickers rocket models. In particular, the opportunities for scale models of future types, so brilliantly shown by the Avro deltas, cannot be ignored.

The knowledge to be gained is invaluable and would certainly justify the not inconsiderable design and construction effort involved. For it is only if such research is carried out that this country can maintain and extend her particular excellence in military aircraft design into the furthermost realms of supersonic flight.

London, W.14. SHOCK-WAVE.

Tail Wind?

I CAN never understand why aircraft are always parked head into wind when it seems obvious to me that, with controls fixed, tail to wind is much safer. The aircraft then tends to be pushed on to the ground instead of being blown off it. This I have practised for many years.

Peterborough. TAILWIND.

High-speed Condensation

I WOULD like to comment on Mr. Frank Jenner's letter, which appeared in *Flight* of September 19th. The vapour rings which he saw flashing rapidly around the outline of the aircraft are not necessarily due to supersonic flight.

At Farnborough on September 3rd and 4th I saw the same phenomena occurring, but only in high-speed flight; humidity was high, and the Hawker Sea Hawk developed what seemed to be rapid intermittent flashing haloes of condensation along the whole length of the upper and lower wing surfaces when it flew across the airfield at high speed. Likewise, the same thing happened to the Hunter and D.H.110, but only near the wing-roots, around the air-intakes.

I believe that these phenomena were created by high-speed wing vibration, which created momentary vacua, and thus condensed the humidity of the air into droplets. (I even

CORRESPONDENCE . . .

experienced rain droplets after some of the high-speed runs had passed over my head at low level near the runway.)

This high-speed vibration or flutter seems to develop at high speed only around surfaces which are not swept-back enough; while all the nearly straight wing of the Sea Hawk was enveloped with this fog, in the Hunter and D.H.110 only the roots of the wing, around the air-intakes, were enveloped. The two balls of vapour appearing when an aircraft passes the speed of sound may be explained in a similar way.

If I may, I would even suggest that tests with this method—of atmosphere saturated with moisture—should be tried in wind-tunnels when experimenting with vibration: something very near to "Wilson's cloud chamber," which is used in obtaining the trails of radio-active particles.

London, W.C.2. YACOV ZAHARI.

DORA Still Lives

THE evil that men do lives after them! Browsing through some Kaiser-war numbers of *Flight* I found in the issue December 18th, 1914, a paragraph revealing that the law requiring all vehicles to carry a red rear light was brought in as a temporary measure when London was blacked-out as a defence against air attack from Zeppelin airships and other aircraft.

The law was at first made for the London Metropolitan Police area only, in an announcement issued by the Press Bureau on December 13th, 1914, which renewed an order by the Home Secretary limiting lighting of shops and other external lights. The order stated: "An entirely new provision is inserted, requiring all vehicles to carry, in addition to any headlights which the existing law requires, a lamp which shows a red light to the rear. Experience shows that this is necessary in the present (darkened) condition of the streets to protect vehicles being run into from behind. It should be particularly noted that this requirement extends to cycles and handcarts."

So we see how purely temporary war-time measures, meant only to apply to special conditions prevailing, remain to plague us.

London, S.W.3. G.D.

[Historically, the point is interesting; there is no comparison, either in speed or volume, between traffic in 1914 and traffic today. Some of the most serious road accidents are due to stationary lorries with extinguished or obscured rear lamps.—ED.]

Early Hollow-steel Airscrews

WITH reference to W/C. Young's letter (September 26th), hollow-steel airscrews in Britain are older than the British aircraft industry itself. Around 1906, the late Sidney Hollands obtained a British patent for such an airscrew. In accordance with Patent Office requirements, reference was made in the specification to the fact that the idea was not new. In other words, patents covering the principle had been taken out in Britain even earlier.

Mr. Hollands subsequently constructed an airscrew on the lines covered by the patent. It was only a small affair compared with present-day designs, being only some six feet in diameter. Between 1907 and 1909 he endeavoured to sell the design to anyone in Britain in any way connected with aeronautics, including the writer. All the surviving pioneers must have had that airscrew offered to them at some time.

His general design was well in advance of the aeronautical knowledge of those days, but it shared the fate of every other invention born long before its time.

London, S.W.17. E. V. HAMMOND.

Naming the 698

THE names suggested for this aircraft by your journal might possibly lead to sharing a take-off order with soccer fans, "up the Albion," the famous exhortation to members of the West Bromwich Albion (and possibly Albion Rovers) team to rise to greater heights. Incidentally, many probably are unaware that Albion was the ancient name for England—I must confess I was until I learnt my history from *Flight*. Most aircraft names are abbreviated in use which no doubt would give us "Alb."; not inappropriate to its present mantle. Another alliterative alternative is "Abaddon," the destroying angel.

Cambridge. PEDANTICA.

I feel it is important that any name given should roll off the tongue easily, and on the first page of my atlas (with another 4½ pages available) I find: "Aberavon," "Aberdare," "Aden," and also, surprisingly enough, "Aberdour." However, personally I feel that "Albion" is an ideal name, from all points of view, for the first bomber of this delta class which will go into service.

Sheffield, 11. A. J. YOUNG.

I suggest as possible names for the Avro 698 the following with genetic connections and truly English: Avro "Angle," "Anglican," and "Anglia."

Cowbridge, Glam. JOHN PROCTOR.

Many people believe in naming the Avro bomber after a city or town, but I suggest naming it after a continent, the mysterious and unknown continent of "Atlantis."

Bishop's Stortford, Herts. C. DENNISON.

It was reported of him that he confined the winds in a bag, and presented them to Ulysses, the ace pilot of the day.

Can there be another name for the greatest wind confiner yet built, the Avro 698, than that of "Aeolus," the king of the storms and the winds?

Bedfont, Middlesex. D. K. JOHNSTON.

May I add to the rapidly growing list of suggested names for the Avro 698.

"Alpha"—unquestionably the 698 is a "first" in every respect, also the definitions—a leader, and chief star in a constellation—make it very appropriate. I also rate "Apollyon," the destroyer, as being rather apt.

May I also through your columns plead to the S.B.A.C. organizers, when arranging next year's exhibition, to give a little thought to we "northerners"; what about Doncaster or Leeds next time?

Mexborough, Yorks. J. R. GREGORY.

BOOK REVIEWS

"Khaki and Blue," by Col. Ronald Sherbrooke-Walker. The St. Catherine Press, 29 Great Queen Street, London, W.C. Illustrated. Price 10s. 6d.

LOYALTY to one's Service and comrades is sometimes old-fashioned in this sophisticated, super-critical age; but there can be few R.A.F. or ex-R.A.F. readers who will not regret Col. Sherbrooke-Walker's 135-page, non-stop attack on the organization, discipline and bearing of the war-time R.A.F. Regiment.

It was no Brigade of Guards, certainly, but it was not intended to be, and never could be, consisting as it did at first of a heterogeneous collection of elderly, mostly Army, officers and young, mostly R.A.F., other ranks, who were often in the Regiment because they were too time-expired or unskilled to do anything else. Admittedly, their saluting probably left much to be desired, and they did sometimes chop up sentry-boxes for firewood. But, on the other hand, they would have given a good account of themselves if Britain had been invaded, and they *did* prove themselves later in campaigns overseas.

One would have expected more tolerance from an author who was a pilot in the R.F.C. in 1916, especially as Col. Sherbrooke-Walker had a unique opportunity to see the Regiment build itself up, in the face of tremendous difficulties and opposition, to a standard where it could take over, from the Coldstreams, guard-duties at Buckingham Palace.

There is, even so, much of interest in the book, and, perhaps, a hidden tribute to the tenacity of the men of the R.A.F. Regiment who created a fine service, despite everything. In any case, as Col. Sherbrooke-Walker is honest enough to admit: "If the position had been reversed and the Army had once again formed its own Flying Corps, would the War Office have kept as tight a rein on the new corps? Would aircraft have been 'fallen in' each morning dressed by the left, and engines started on a 'double flam' on the drum?"

* * *

"Observer's Handbook." Published for the Meteorological Office, Air Ministry, by Her Majesty's Stationery Office, London. Price 12s 6d.

THIS handbook describes observing methods practised at all types of meteorological station, synoptic and climatological. Though based on its predecessor, the *Meteorological Observer's Handbook*, the new volume differs from it in that prominence is given to the international codes in use since January 1st, 1949; and questions of the siting and equipment of stations are omitted from the main text, which is concerned solely with observing. After some general notes on procedure at particular types of station, methods of observing the separate elements are successively described, and sufficient information on instruments is given for the purposes of maintenance and normal use. In appendices are discussed problems connected with the setting-up of stations and the recording of observations; conversion and correction tables are also provided.

The subject-matter is well presented throughout, diagrams and photographs are pertinent and clear, and there is a comprehensive index—all essential qualities for any worthwhile textbook.

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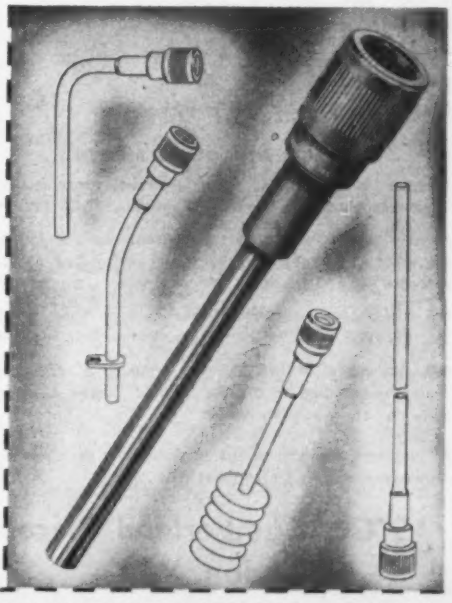

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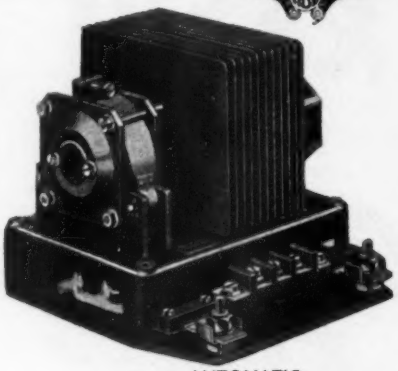

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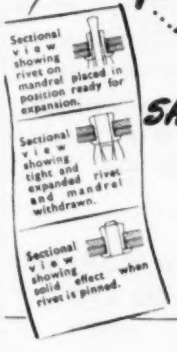
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PUBLIC ANNOUNCEMENTS

AIR TRANSPORT ADVISORY COUNCIL

THE Air Transport Advisory Council give notice that they have received the under-mentioned applications to operate scheduled air services:—

APPLICATION No. 64 from Airwork, Ltd., 15, Chesterfield Street, London, W.1 for a Colonial coach service with Viking (VC1) aircraft for the carriage of passengers, supplementary freight and mail between London (Blackbushe) and Kano (W. Africa) with an intermediate traffic stop at Gibraltar at an initial frequency of from one service fortnightly to one service weekly during the period from December 1st, 1952 to November 30th, 1959.

Application No. 65 from Manx Air Charters, Ltd., of Ronaldsway Airport, Isle of Man. For a U.K. Internal service initially with DH. 89A aircraft for the carriage of passengers and supplementary freight between Isle of Man (Ronaldsway) and Glasgow (Renfrew) at an initial frequency of from 7 to 22 services weekly during the period from May 2nd, 1953 to May 1st, 1959.

Application No. 66 from Transair, Ltd., of Croydon Airport, Croydon, Surrey. For an all freight service with Avro Anson and Dakota aircraft for the carriage of freight between London (Croydon or Gatwick) and Paris (Le Bourget) at a frequency of from 8 to 12 services weekly during the period from March 1st, 1953 to February, 1958.

FROM Airwork, Ltd., 15, Chesterfield Street, London, W.1:—

Application No. 43 (revised) for a Colonial coach service with Viking (VC1) aircraft for the carriage of passengers and supplementary freight between London (Blackbushe) and Salisbury (Rhodesia) with intermediate traffic stops at Malta, Khartoum and Entebbe at an initial frequency of from 1 to 2 services weekly during the period from November 1st, 1952 to October 31st, 1959.

Application No. 44 (revised) for a normal scheduled service with Hermes aircraft for the carriage of passengers and supplementary freight between London (Blackbushe) and Livingstone (Northern Rhodesia) and later Salisbury (Kentucky Airport) with intermediate traffic stops at Malta, Khartoum and Entebbe at an initial frequency of from 1 to 2 services weekly during the period from December 1st, 1952 to November 30th, 1959.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30th, 1952. Any representations or objection with reward to these applications must be made in writing, stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 9, Buckingham Gate, London, S.W.1, from whom further details of the applications may be obtained. [0778

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with 1,000 lb. payload at 5,400 ft and cruising speed of 155 m.p.h., 430 miles. Range with 700 lb. payload at 7,000 ft, cruising at 150 m.p.h., 750 miles.

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R. W. SUTTON (CONSULTANTS), Ltd., 7, Lansdown Place, Cheltenham. Tel. 3811. [0705

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GRADUATES with honours degree in engineering, mathematics, physics or equivalent, are required for work on the design of a large wind tunnel. Initially the work will be in London, moving later to Bedford where some assistance may be given with housing. At le as two years' experience in aerodynamics, preferably in a wind tunnel, is required.—Apply, stating age, qualifications, experience, to Aircraft Research Association, Ltd., 189 Regent Street, London, W.1. [0772

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HANDLEY PAGE, Ltd., have vacancies for:—

AERODYNAMICISTS of degree standard or with H.N.C. in aero subjects. Previous experience preferred.

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SENIOR and junior assistants of degree or H.N.C. standard for the mechanical and structural test department at Radlett.

WRITE, stating age, qualifications and details of experience, to Staff Officer, Handley Page, Ltd., Cricklewood, London, N.W.2. [8694

UNIVERSITY OF SOUTHAMPTON—Department of Aeronautical Engineering.

APPLICATIONS are invited for the appointment of a lecturer or assistant lecturer tenable from January 1st, 1953. Candidates should be qualified Engineers in Aircraft structures and design and experience in aerodynamics is desirable. Salary scales: lecturer £550 × £50–£1,100; assistant lecturer £400 × £50–£500, plus children's allowance and F.S.S.U. benefits. Further particulars may be obtained from the Secretary and Registrar, The University, Southampton.

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BRITISH OVERSEAS AIRWAYS CORPORATION have vacancies for engineer officers (flight engineers).

APPLICANTS must be between 21 and 35 years of age, of a high standard of physical fitness and education to matriculation or equivalent standard. A sound engineering background and training is essential and only those with a maintenance engineer's licence endorsed in categories "A" and "C" (preferably on modern four-engined aircraft) will be considered. Successful applicants will be appointed for a probationary period while undergoing training. Salary for qualified men commences at £725 per annum rising to a maximum of £1,345 per annum, plus certain allowances payable whilst on service.—Application should be addressed to Chief Personnel Officer, B.O.A.C., Airways House, Great West Road, Brentford, Middx. [8704

FOUR experienced weight engineers required with first class qualifications of Ordinary National Certificate. Apply Employment Manager, Vickers-Armstrongs Ltd. (Aircraft Section), Weybridge Works, Weybridge, Surrey. [8724

APPLICATIONS are invited for the following positions in the London area:

DRAUGHTSMEN required for detail drawing of experimental designs of aircraft electrical equipment. Works experience essential. The positions are superannuable and give considerable scope to men with adequate experience. Write giving full details in strict confidence to the Employment Office, Rotax Ltd., Chandos Road, Willesden Junction, N.W.10. [8746

APPLICATIONS are invited for the following positions in the London area:

DEVELOPMENT engineers required by manufacturers of a.c. and d.c. electrical equipment for aircraft. Applicants should be at least a Higher National Certificate or preferably an engineering degree. The positions are superannuable and give considerable scope to men with adequate experience. Write giving full details in strict confidence to the Employment Office, Rotax Ltd., Chandos Road, Willesden Junction, N.W.10. [8746

DESIGN and detail draughtsmen are required for interesting work on the following:—

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SENIOR aerodynamicist required for interesting work in connection with the design of high-speed aircraft. POSSIBILITY of assistance with housing.

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WRITE or call Staff Supt. (Recruitment), B.O.A.C., London Airport, Hounslow, Middx. [8781

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RESEARCH engineer required for turbine laboratory, experienced in precise measurement of gas flow and familiar with scientific experimental techniques. Successful candidate will operate plant and be responsible for care and accuracy of instrumentation. Alternatively UNIVERSITY GRADUATES with an interest in this work would be considered.

ALSO

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HANDLEY PAGE, Ltd., require a technical assistant of degree or H.N.C. standard to c, rry out work on thermodynamic problems for aircraft air conditioning and thermal de-icing systems.—Write, stating age and giving particulars of qualifications and experience, to Staff Officer, Handley Page, Ltd., Claremont Road, London, N.W.2. [8686

BOULTON PAUL AIRCRAFT, Ltd., have a number of vacancies for senior and intermediate draughtsmen, preferably with aircraft experience. Possession of O.N.C. or H.N.C. (Mech.) an advantage. Applications stating age, qualifications, details of experience and salary required to Personnel Manager, Boulton Paul Aircraft, Ltd., Wolverhampton. [8768

NAPIER AND SON, Ltd., Luton Airport, Beds. require for design study, technical assistants of degree or at least H.S.C. standard, preferably with some aerodynamics knowledge, and, if possible, experience in assessment of aircraft performance.—Apply with full particulars of experience and state salary expected to above address. [8769

SENIOR jig and tool draughtsmen, capable of designing with minimum supervision, tooling equipment for producing reciprocating and internal combustion engines. Workshop background advantageous. Salary according to ability. Staff canteen, 5-day week.—Write with particulars to The Personnel Officer, The de Havilland Engine Co., Ltd., Stonegrove, Edgware, Middlesex. [8758

AIRTECH, Ltd., Aylesbury and Thame Airport, Haddenham, Bucks, require a planning engineer with at least 4 years' planning experience on metal aircraft and light engineering. Must be capable of handling complete projects from detail to assembly stage.—Write in first instance giving full particulars of training, qualifications, experience, age and salary required. [8765

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APPLICATIONS are invited from senior and intermediate design draughtsmen. Experience of aero-engine design desirable, but not essential. Also checkers. —Please write, stating age and giving details of previous experience in chronological order, to the Personnel Officer, The de Havilland Engine Co., Ltd., Star Lane, Edgware, Middlesex. [8690

AIRTECH, Ltd., Aylesbury and Thame Airport, Haddenham, Bucks. Require a planning engineer with at least 4 years' planning experience on metal aircraft and light engineering. Must be capable of handling complete projects from detail to assembly stage.—Write in first instance giving full particulars of training, qualifications, experience, age and salary required. [8774

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TECHNICAL assistant. Young man with B.Sc.(Mech.) or engineering degree and sound shop experience required to assist in the investigation and solution of practical problems concerning the construction of and installation in experimental aircraft. Good commencing salary. Superannuation.—Apply fully to Personnel Supervisor, Hawker Aircraft, Ltd., Kingston-on-Thames, Surrey. [8770

AIRCRAFT draughtsmen with experience of gun installations required by the Aircraft Division of the English Electric Company, Ltd., at Warton Aerodrome, near Blackpool. Salaries commensurate with qualifications and experience.—Write, with full details quoting reference 186 to the English Electric Company, Ltd., Central Personnel Services, 24-30, Gillingham Street, London, S.W.1. [8724

APPLICATIONS are invited from design draughtsmen and stressmen, also technical assistants with combined design and performance experience for work on both reciprocating and gas turbine aero engines. Applications should state full particulars of experience and qualifications and should be addressed to the Personnel Officer, The de Havilland Engine Co., Ltd., Star Lane, Edgware, Middlesex. [8832

A. V. ROE and Co. require a radio operator for aircrew duties on flight test work at Woodford Aerodrome, Cheshire. Applicants should possess a current P.M.G. radio operator's licence and should be interested in the installation of various types of radio facilities fitted in the present day aircraft.—Write, giving full particulars of previous experience, age, etc., to the Labour Manager, A.V. Roe and Co., Ltd., Greengate, Middleton, Manchester. [8717

A vacancy exists for an estimator-ratefixer. Candidates must have served an engineering apprenticeship and had at least 4 years' experience of rate fixing as applied to sheet metal workers on aircraft manufacture and light engineering. Salary according to experience and qualifications.—Write, giving particulars of age, training, technical qualifications and ratefixing experience, to Airtech, Ltd., Aylesbury and Thame Airport, Haddenham, Bucks. [8773

HYDRAULICS. Senior design draughtsman required with first-class knowledge of basic principles of hydraulics and having several years' experience on aircraft systems. This is a senior position with good prospects of promotion for the selected applicant. The location of the factory is in the Home Counties and the salary will be commensurate with qualifications and experience.—Write, stating age and full details to Box AC 75815, Samson Clarke, 57/61 Mortimer Street, London, W.1. [8748

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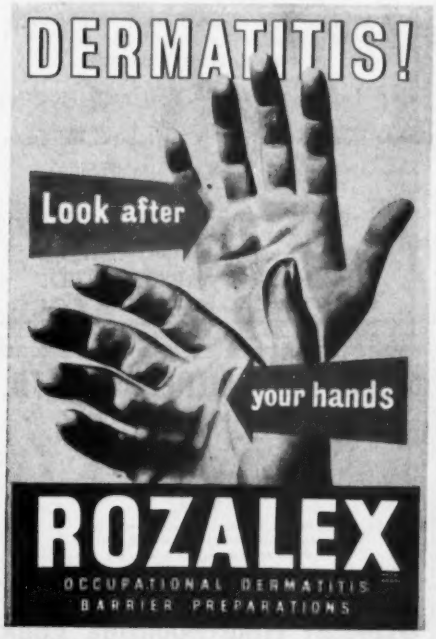

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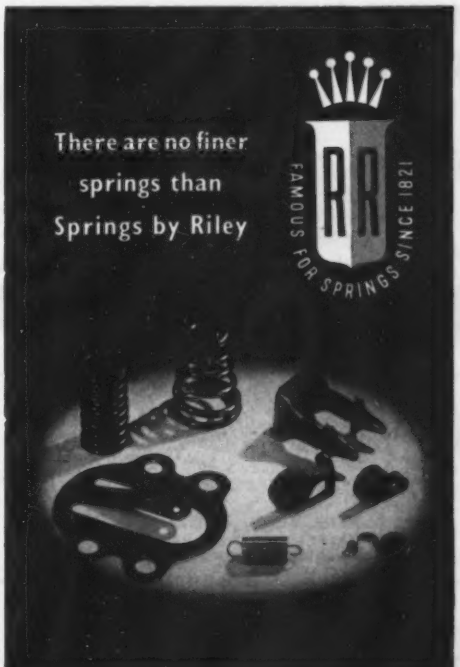

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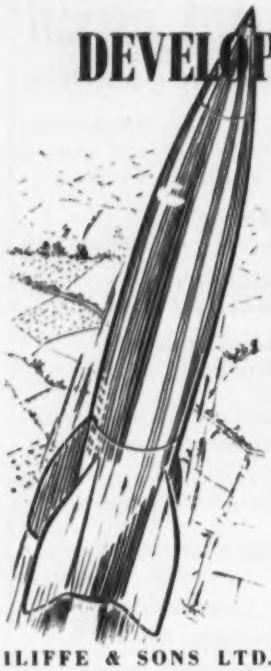

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